VOL. 28, NO. 6 JUNE, 1951

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Published Monthly by the AMERICAN JOURNAL OF OPTOMETRY PUBLISHING ASSOCIATION, 1502 Foshay Tower, 821 Marquette Ave., Minneapolis 2, Minn.

ANNUAL SUBSCRIPTION, UNITED STATES and CANADA $6.00. FOREIGN $6.50
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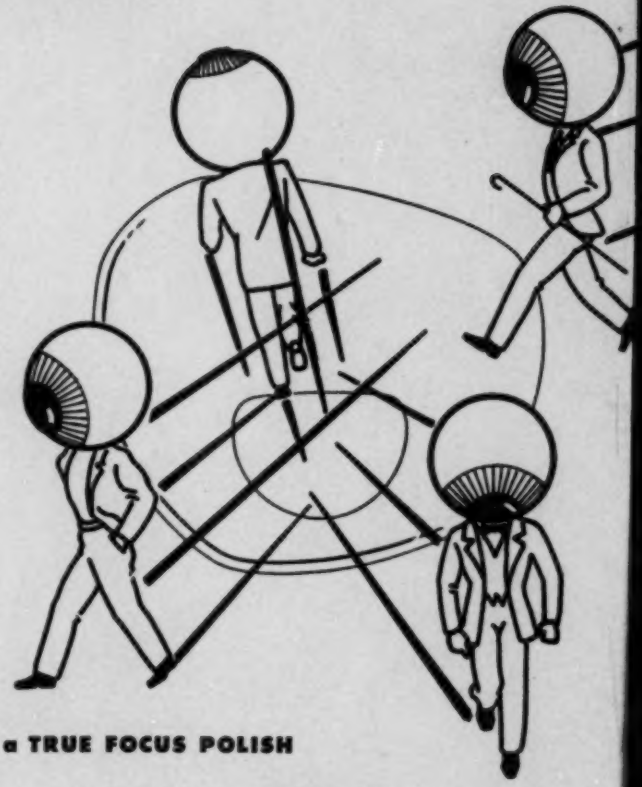

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Publication Office: 1502 Foshay Tower, 821 Marquette Ave., Minneapolis 2, Minn.

AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY

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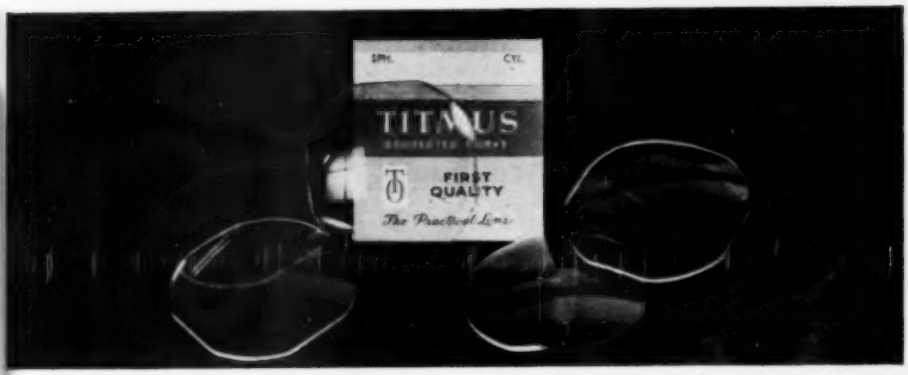

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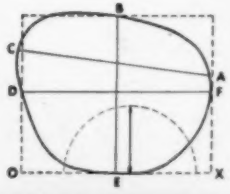

EYE	AC x BE	DF x BE	BRIDGE
40	41 x 34	40 x 34	18-20-22
42	43 x 36	42 x 36	18-20-22-24
44	45 x 38	44 x 38	18-20-22-24
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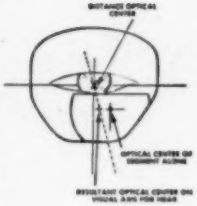

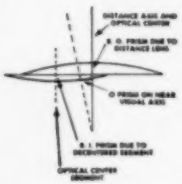

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AMERICAN JOURNAL OF OPTOMETRY
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Vol. 28 June, 1951 No. 6

EDUCATION IN INTERPROFESSIONAL RELATIONS*

Carel C. Koch†
Minneapolis, Minnesota

At this time, when we are gathered here to dedicate the new building which is to house the School of Optometry at The Ohio State University, I wish, on behalf of the profession, to first pay tribute to the educators who have developed this school into one of the foremost institutions teaching ocular refraction in the world today.

Started in 1914, this School of Optometry has grown to occupy an important place in education. Throughout the years this school has given to the public service, a large number of well trained optometrists who practice today in every county of Ohio and in every state. We in optometry are proud of the educators who have made this work possible. Particularly, I would like to mention Dr. Charles Sheard who was placed in charge of the program of Applied Optics in 1914. And also, Dr. H. B. Minchin, Dr. Morgan Davies, Dr. C. R. Ellis and our present director, Dr. Glenn A. Fry, all of whom have carried on the work so ably started by Dr. Sheard.

And, too, we in optometry are thankful to the state and University officials who have given so much of the public funds plus their time and effort to make this school the recognized success it is today. We in optometry are thankful, too, for the excellent support of the alumni group who are solidly behind this institution with their work and funds and who will continue to be loyal supporters of this undertaking.

The teaching and clinical instruction at the School of Optometry, The Ohio State University, has been excellent. The undergraduate student during his stay at this professional school is well grounded in the fundamental optometric sciences, the physical sciences, the biological sciences and the liberal arts courses. He also is well trained in screening those cases which may require medical or surgical care from among that

*Presented as the dedication address at the Optometry Building Dedication, The Ohio State University, Columbus, Ohio, June 10, 1951.

†Optometrist. Fellow, American Academy of Optometry. Editor, AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

large group of patients who suffer only from visual defects. In this latter teaching work, ophthalmologists now stand ready to make the work of all optometry schools even more effective as the door to closer cooperation between optometry and medicine now stands open and ophthalmological leadership is pledged, in the public interest, to assist.

We in optometry are glad that this is so. As optometrists we have no thought or desire to invade the field of ophthalmology. Yet, as professional men and public servants we must do everything possible to adequately care for the visual needs of patients. When this care requires a referral to a physician or ophthalmologist we are and must continue to be trained to recognize this situation immediately. We in optometric education welcome the assistance of ophthalmologists in this specialized training program and look forward to their wholehearted cooperation.

As a step in securing this cooperation and general unity of purpose in the entire field of blindness prevention, the National Interprofessional Committee on Eye Care was established during the late summer of 1950. The committee itself is an outgrowth of a joint action on the part of ophthalmological sections and societies to which both optometrists and opticians were invited. The committee was established to enable all three of the groups serving the public in the broad field of eye care to cooperate in their respective spheres to the end that the public will be better served.

The ophthalmologists on the committee are: Dr. Avery D. Prangen, of the University of Minnesota and the Mayo Clinic, Rochester. Dr. Prangen serves as chairman of the committee. Also Dr. Arthur Culler, chairman of the department of ophthalmology, Medical School, The Ohio State University, Columbus; Dr. F. Cordes, chairman of the department of ophthalmology, Medical School, University of California, San Francisco, and Dr. William F. Hughes, department of ophthalmology, Medical School, University of Illinois, Chicago.

Opticianry is represented on the committee by Mr. Leslie Myers, chairman of the board of the Benson Optical Company, Minneapolis. Mr. Myers is president of the American Board of Opticianry and serves as vice chairman of the National Interprofessional Committee on Eye Care. Opticianry is also represented by Mr. Norman MacLeod, president, MacLeod Optical Company, Providence, a past president of the Independent Optical Wholesalers Association, and by Mr. Harry Carpenter, Syracuse, chairman of the board of the Guild of Prescription Opticians of America.

Optometry is represented on the committee by Dr. H. Ward Ewalt, Jr., Pittsburgh, chairman of the committee on education and

professional guidance of the American Optometric Association. Also by Dr. Glenn Moore, Chicago, chairman of the interprofessional relations committee of the American Optometric Association, and by your speaker, who is secretary of the American Academy of Optometry and Editor of the AMERICAN JOURNAL OF OTOMETRY. Your speaker also serves as secretary of the National Interprofessional Committee on Eye Care.

Also on the committee is Dr. Henry Imus, formerly of the Dartmouth Eye Institute and now of the Bureau of Naval Research, Washington, D. C. In addition to these, the committee is fortunate to have as a member Dr. Franklin Foote, executive director of the National Society for the Prevention of Blindness. Dr. Foote has given the committee excellent advice and cooperation and he has alerted his entire organization to further the cooperative work of the committee at the state level.

This work of the committee includes recommendations designed to eliminate causes of friction between ophthalmology, optometry and opticianry . . . cooperative educational activities . . . joint efforts to eliminate remaining commercial practices in the field of eye care . . . cooperative legislative activities . . . the furtherance of those particular programs which will tend to safeguard the vision of the public, and the formation of joint state committees on eye care, similar in purpose and make up to the national committee, to work specifically at the state level.

The National Interprofessional Committee on Eye Care already has demonstrated that at the national level, the members of the professions served by it can cooperate and work together on mutual problems with considerable success. The recommendations of the committee are referred back to the parent bodies in ophthalmology, optometry and opticianry for study and appropriate action. While new, the committee already has had much to encourage it, and it is hoped that this work will make much additional progress in the months and years ahead.

One of the problems confronting both the educators in our schools and members of the National Interprofessional Committee on Eye Care is that of sensational professional journalism. While naturally nothing should be done to limit the freedom of the press, those in charge of the editorial policies of the scientific and other publications serving eye men have important responsibilities. When fully lived up to, these responsibilities will have a marked effect in improving this literature.

In scientific journalism these responsibilities are first, to require an

adherence to basic scientific principles on the part of the authors who submit technical manuscripts. And second, an adherence to the fundamental principles of good taste in discussing reforms or proposed changes in matters dealing with social or economic aspects of eye care. Particularly is this true in discussing problems relating to interprofessional relations.

Any deviation from these principles is bound to upset interprofessional relationships and the repercussions frequently have adverse effects not only on those doing eye work but also upon social workers, educators in allied fields and even governmental departments dealing with health and social problems.

The responsibilities of editors are quite similar in many respects to those of educators. In each case scientific subjects are being discussed and in each case opinions are being molded.

In optometry, our professional schools, under the guidance of competent educators have eliminated to a very high degree those theories and speculative techniques which over the years have failed to measure up to or square with basic scientific principles which form the basis of our work. No educator would permit an improperly trained or irresponsible individual to lecture to his students. Editors of scientific periodicals must adhere to similar rules.

Scientific publications are not open forums.

There is no justification for the inclusion of improper unscientific material dealing with visual care in any publication serving the eye field. The publishing of such material opens the door for criticism by allied professions and by the entire scientific world. In addition, it tends to confuse and mislead those who read the publication no matter how well trained they are.

The same applies to the non-technical material which is published. Particularly with the special reports dealing with economic matters affecting professional well being, or with the social aspects of eye care. Here the fundamental requirements of truth and good taste apply and non-constructive sensational criticism should be eliminated.

I am not advocating that new scientific theories be kept out of our literature. But I do suggest that when proposed in the literature, new theories be labeled as such, and not published as accepted and proven fact. In addition, the author should be expected to marshall all the supporting data possible to uphold his thesis. In his manuscript the author should also be required to review the literature first to determine just what has already been done in this field and to assure himself that he is not overlooking pertinent work already published

which has a bearing upon his theory. These at least are the minimum requirements of scientific writing, and basically the new proposed theory should have some support in the already proven and accepted principles which underlie refractive work.

Neither am I advocating the elimination of critical articles dealing with current practices in eye care. In fact this article criticizes current practices. Criticism is necessary, but abusive and non-constructive criticism is both harmful to interprofessional relations and to the profession itself, as it lowers the general tone of professional practice.

As optometrists we are judged in part by our literature. Just as we are judged partially by our schools and our standards of practice. Our literature enables others, in a measure at least, to evaluate our mental processes and as such, our publications are the picture window through which others view the profession.

On this occasion, as we dedicate a building to house a professional school, it is fitting therefore to review several suggestions relating to our science as this is advanced through the printed page serving optometric education.

I am concerned with a situation insofar as elements of this press have not materially changed their attitude as professional education has advanced. In fact, some of the publications serving the field, judging from their content, still consider themselves trade as well as professional publications.

I believe the time has come for a complete severance of optometric literature from that literature dealing with opticianry and mechanical ophthalmic optics. I admit that there is a need for well edited technical and trade journals in opticianry, but I believe that journals serving the optometric profession should uniformly adhere to the accepted principles of professional scientific publications and eliminate the open forum characteristics of typical trade journals.

No profession can be adequately served by non-professional publications nor do I believe it proper that such publications attempt this assignment.

Optometry having an established stature as an independent profession should now properly turn its attention to its literature. A thoroughly live and vital optometric press would be a stimulus to greater scientific attainment and to a finer type of clinical practice. It is essential that we have this, as we are judged by our literature among other professions and as long as this press is not entirely scientific and professional the inevitable conclusion is that we have not reached full pro-

fessional stature. Furthermore the present technical optometric demands of our profession require this change.

The standards for professional scientific publications are high. In optometry, as in other scientific fields, these require competent screening of submitted technical material which in turn necessitates a trained staff of professionally qualified personnel, and an adherence to subjects germane to optometric practice. In addition, these standards require a degree of editorial integrity sufficient to reject those manuscripts of doubtful scientific accuracy.

I believe that optometric technical publications can best be edited by practicing optometrists or optometric educators who also practice. These men must be chosen for their respective tasks on the basis of their proven technical skills, plus the demonstrated ability required of a scientific editor.

In my judgment, the time has arrived for the profession to take the necessary steps to place all of its literature on the accepted plane of scientific writing. The scientific press serving optometry, must, if it is to parallel the excellent teaching work of our undergraduate professional schools, revise its policies and fully adhere to the following essential principles. These are three in number.

First, each publication must provide one or more competent staff persons serving in authoritative editorial capacities whose duty it shall be to screen, select or reject, and edit scientific manuscripts which are submitted for publication. This supervisory work must be in the hands of at least one qualified optometric editor.

The need for this first requirement is obvious to all students of refraction today. Non-optometric editors unfamiliar with the complex factors underlying modern scientific refraction find it difficult to judge the quality of submitted technical material. No matter how well intentioned they may be they are nevertheless unable to screen scientific manuscripts properly.

It is therefore suggested that this job of scientific editorial work be filled by journalistically trained practicing optometrists or optometric educators who devote some time to clinical practice. Most optometric publications already have some such editorial help and when these departments are strengthened, the tone and quality of our literature will improve.

The second essential principle is that the scientific press refrain from publishing unwarranted attacks upon others serving in the eye field. Our most effective work as optometrists can be done on a mutually cooperative basis with both ophthalmology and opticianry. The constant

harping in our publications on the shortcomings of other specialists impairs the relationship which exists between these groups and opens the door to the malcontents in every group whose only wish is to stir up trouble between the professions serving in the field of eye care. This unnecessary animosity and discord in turn reduces the effectiveness of the work we can all do in the public interest.

The third and last essential principle that those editors and publishers of scientific optometric journals must realize is that optometry is part of a great team serving the public in the overall field of eye care. Each member of this team has his proper place in this important work—the optometrist, the ophthalmologist and the optician. Each is well equipped to serve the public in his own way, and through close cooperation of all three groups the public will be given a better and more unified eye care than ever before.

Editorial policies based on these principles will result in a better type of optometric journalism. It will also produce a better informed group of optometric practitioners and the press in optometry will take its proper place as a strong and vital supplement to our excellent educational centers.

The professional schools of undergraduate training in optometry are foremost in the movement towards more wholesome interprofessional relations between optometry, ophthalmology and opticianry. Your own director of the School of Optometry, Dr. Glenn A. Fry, has been one of the leaders in this fine work. Our schools have learned the advantage of such cooperation and at this time, when we in optometry are celebrating the dedication of this new building, to house the optometry school at The Ohio State University, we should in our hearts, dedicate ourselves to a future of close and harmonious cooperative work among all men serving in the field of eye care.

ABSTRACTS

THE ILLUMINATION OF THE SNELLEN CHART. M. Gilbert and R. G. Hopkinson. Brit. J. Ophth., 33(5), 305-310, May, 1949.

The experiment described in this paper was thought to be of interest to clinicians interested in the effect of illumination on visual acuity as measured by the standard Snellen chart.

The subjects were 15 adults in the 20 to 40 age group. Various refractive errors were included and some of the observers were tested with and without their corrections. The observations were made from a distance of 6 meters when the Snellen chart was illuminated by 0.1 ft. candles; 3 ft. candles; and, 100 ft. candles.

The results show clearly that an increase in illumination of the order of 10 to 1 improves the acuity by one line on the Snellen chart. The effect is slightly greater for those with poor vision than for those with good vision, especially at the higher levels of illumination.

R. E. B.

A STUDY OF THE FLATTENING EFFECT PRODUCED BY OPTICAL MAGNIFICATION*

S. Howard Bartley†
Michigan State College
East Lansing, Michigan

The purpose of this paper is to discuss one of the outstanding effects produced under instrumental magnification, as for example in viewing objects with a pair of binoculars. With instrumental magnification some form of change in the relation of the seen object to the stimulus pattern always occurs. One of these results we shall speak of as a flattening effect, or a reduction in the third dimension of the object seen. Reduction in third dimension, of course, only goes hand-in-hand with a change in angular values of the various surfaces with relation to each other, and is a shortcut way of saying that this takes place.

A suitable object for demonstrating the flattening effect is a cube viewed with one edge toward the observer and from a level which permits seeing the top of the cube as well as two of its sides. When such an object is viewed through a pair of binoculars or field glasses, it is no longer a cube in appearance. What was initially taken to be an object with all right angles is now a solid with a diamond-shaped top. This is to say, the angles formed by the near and far edges are greater than 90 degrees, and the angles formed at the other two edges are decidedly less than 90 degrees. Visually, the object has lost its initial identity and can no longer be called a cube.

Although this has been used in some quarters[1] as a demonstration, no formal quantitative study has been made of the phenomenon or any of the several others related to it, until recently, Miller and Bartley investigated the effect of viewing a circle and a series of ellipses, both in the normal position and at various angles of tilt. They compared the appearance of the figures with the unaided eye and with instrumental magnification. The tilting of plane forms makes them effectively three-dimensional figures as far as the operation of the geometry involved in space perception is concerned. These investigators wished to see whether a reduction of the third-dimensional aspect of space was involved as

*Read before the annual meeting of the American Academy of Optometry, Chicago, Illinois, December 16, 1950. For publication in the June, 1951, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Professor of Psychology, Ph.D. Fellow, American Academy of Optometry.

[1]Miller, James W. and Bartley, S. Howard: Some Effects of Optical Magnification on the Perception of Ellipses. (Not yet published.)

is so obvious in the case of the three-dimensional solid, the cube.

Their work related not only to the flattening effect of instrumental magnification but also to the work of Thouless[2] who studied what he called "the law of phenomenal regression." He used a card cut in the shape of a circle and one in the shape of a square. These were placed, one at a time at different distances from the observer, on a long table. The observer was stationed at one end of the table and his eye level, in being above the table, resulted in seeing the cards at various degrees of obliqueness depending upon the distance at which the cards were placed from the observer. Thouless distinguished between the nature of the real object itself, the shape of the image of the object upon the retina, and the shape which the observer saw. In order to determine what the seen shape of the object was, the observer was asked to draw the object which he saw. The data obtained then were the ratios between the long and the short axes of the objects drawn. Thouless called the cards themselves the real objects, designated as R; the retinal images as the stimulus objects, designated as S; and the objects as seen, the phenomenal objects, designated as P. The investigation consisted, then, in noting the relation of P to R and S. In virtually every case, the ratio of the short to the long axis of P, the figure drawn, lay between that of R and S. Thouless referred to this as regression to the real object. Since the nature of the real object was known to the observers, it might be thought that the concept of a circle and of a square were functioning somehow in this situation. Miller and Bartley, in using the circle and a series of ellipses as well, prevented their observers from literally knowing the shape of the figures at which they were looking. It is also not so likely that ellipses are fixed ideal forms to which seen objects are to be compared as is the case for a circle.

The data that Miller and Bartley obtained were first inspected from the standpoint of regression to the real object. It was found that the ratios of the minor to major axes in the drawings of their observers lay between those of the real objects, R and the stimulus objects S. That is, there was regression to the real object with tilted ellipses viewed with the naked eye, and under 2x magnification respectively. But there was in all cases a greater amount of regression with naked-eye observation than with the binoculars.

In order to answer the question of whether this distinction meant that the visual field was flattened, certain geometrical and perceptual considerations had to be taken into account. First, a comparison of

[2]Thouless, R. H.: Phenomenal Regression to the Real Object. Brit. J. Psychol. 21: 339-359, 1931.

what happens to the retinal image as it is enlarged in each of two ways was reviewed. The first way in which a retinal image may be enlarged is to bring the original object closer to the eye. If one diagrams the geometrical optics of this, it will be seen that not all portions of the retinal image of a three-dimensional object will be enlarged proportionately. Using the original position as a reference, we may say that asymmetry is introduced in the retinal images, when images are magnified by this method.

The second way that a retinal image may be enlarged is to use an optical instrument such as a pair of binoculars, just as was done in the experiment. In this case all features of the retinal image are enlarged proportionately. Thus it is obvious that there is no asymmetry introduced, or if an initial asymmetry exists, it is not changed. Thus the two modes of image magnification are essentially dissimilar. This dissimilarity is bound to have perceptual consequences.

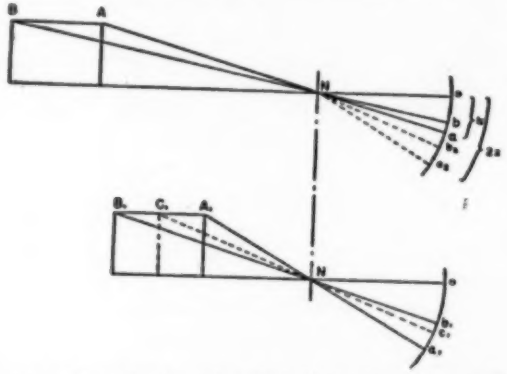

Fig. 1. A diagram to show that a number of visual targets may occupy the same visual angles, and that without collateral visual cues may be seen as the same object despite their differences in distance from the observer, or the differences in orientation to him.

Figure 1 shows how the principle applies to a solid, the one-half of which is shown in each of two diagrams in the figure. In the upper, the object AB is at full distance; in the lower, it is at half distance. As the front edge object is brought twice as close, the retinal image is made twice as large in over-all dimensions. A_1 is represented by a_1 on the retina as A was originally represented by a. The distance oa_1 is twice that of oa. But at the same time ob_1 is not twice that of ob. This is because the back edge of the solid was not brought twice as near as it was to begin with. However, when the retinal image is made twice

as large in over-all dimensions by instrumental magnification, ob_2 does become twice as great as ob. If we now place a point c_1 on the lower diagram so that oc_1 is equal to ob_2, we may project a line through nodal point N onto the line A_1B_1. If a perpendicular is dropped from the point of intersection, the line will represent the new apparent back edge of the solid, as far as the shape of the retinal image is concerned. Thus it will be seen that the solid is now diminished in its third dimension.

In order to further the understanding of the effects brought about by instrumental magnification, let us consider what happens in the

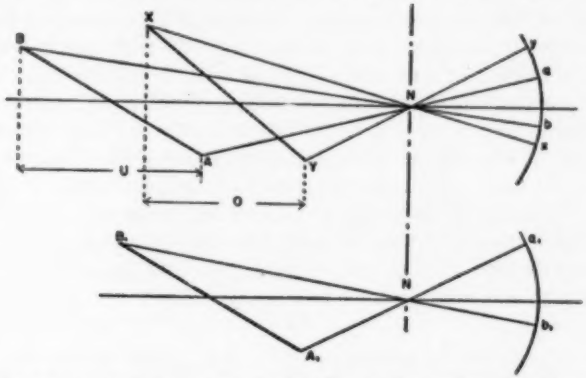

Fig. 2. Diagrams to show the effects upon the shape and size of the retinal image when an object is brought closer to the eye and when the image is magnified by instrumental means. The object in this case is a solid and thus three-dimensional.

case of a tilted plane figure. For this, refer to Figure 2. In it are two diagrams. The upper one indicates the tilted figure at full distance, and the bottom diagram shows it at half distance. It will readily be seen that the amount of asymmetry in the retinal image with the figure at the two distances is dissimilar. The nearer the figure, the greater the asymmetry in the retinal image. This shift is not brought about by using instrumental magnification, as will be seen by the dotted lines in the upper diagram, where oa and ob are simply made twice as great. The magnified image in this case is now labelled xy. If we project from points x and y through the nodal point N, the proper visual angle is provided for the object as seen under instrumental magnification. Since the object thus seen and the object seen with the naked eye are equal in size, we can use a new line (Y X) equal in length to AB to represent the near object. Point Y will be at half distance. When line YX

is made to fit into the visual angle we have provided, the tilt will be different than the tilt of AB, the line seen by the naked eye. Thus if the new figure-dimension represented by the line YX is not different than AB, but its tilt is different, YX must occupy a smaller third dimension than that occupied by AB.

The general principle may be studied further. For this purpose, other forms may be used. A form that is in many respects like that of a solid is one made by two intersecting planes. To describe it more simply, we could call it an open book oriented with the hinge toward or away from the observer. Such a form may be manipulated so that the angle of opening may be made to appear as a right angle. Another form is one that could be called an open cube. It is a form having four of the six surfaces of a cube, the top and bottom surfaces being absent. For our purposes, it is the open-book form doubled, that is, two open books facing each other and joined. Such a form provides more angles for the use of the observer and likewise has some of the "ideal" features of the solid cube. The open cube can be manipulated experimentally so that it may be made to appear to be a cube and have the necessary right angles. One might expect that the results of using the open book figure and the open cube would be dissimilar. The object of the present investigation was to study both figures under unaided vision and with a 2x binocular.

It is appropriate in dealing with these forms to use the three-category classification that Thouless used, and make comparisons between the "real" object, the stimulus object and the phenomenal object. In doing this, the stimulus object is obtained by calculation from the observation distance, or distances used, and from the setting of the figures that provide for their appearance as right-angled figures. For our purposes the present experiment differs from the previous ones in one important respect. In the present experiment, R and P are made equal and the problem is to obtain the value of S providing for this equality. In previous investigations, R and S were fixed quantities and the value of P was the quantity to be determined. P was thus never equal to R, but only approached it. P always lay somewhere between R and S, and was said to regress toward R. In the present case we are involving the principle of regression but only a special case of it. We are asking the value of S when regression is complete; that is, when P equals R.

Naturally, in this experiment we are concerned with unaided vision as well as the results when binoculars are used. Whereas we might suppose that with the naked eye a cube looks like a cube; this need not

be so. If so, a right-angled figure would be taken as the reference for the difference between the figure seen with the unaided eye and with the binoculars.

If the observer, using unaided vision, is allowed to adjust or have the figure adjusted so as to appear right angled, the actual angles of the figure might have to be other than 90 degrees. Of course, we know that the stimulus object (S) is far from being right angled. It was deemed appropriate to make settings of the open book and open cube with the naked eye to use as a reference or control in evaluating the results under magnification.

Procedure. For the first part of the study, an open book figure made of heavy cardboard was placed on the floor of a long room and viewed at various distances: that is, at 10, 20, 30, and 40 feet. The main reason for using various distances was to provide different angles of observation. The nearer to the figure the observer, the more nearly the angle approached the one provided by directly looking down on the figure from a standing position. In other words, the manipulation of distance manipulated the form of S. Both unaided vision and observation under magnification was used, and two levels of illumination were also tried. These leves were 2 c/ft.c and 0.3 c/ft.c respectively.

For the second part of the study, the open cube and the open book were compared at a distance of 10 feet and under the higher level of illumination.

Results. At present, an insufficient number of readings have been obtained to verify the apparent slight difference between the effects obtained at the two levels of illumination and between the readings at the various distances.

It was found that the observers differed in their average settings needed for seeing the open cube as a cube. Some required it to be somewhat flattened in the third dimension to be seen as right angled, and some required the opposite to a slight degree. To account for this, we must resort to some of the principles to be mentioned later, or to the usual explanation of the subject using different criteria in their observations. In all cases there was a substantial difference between the settings with and without binoculars. There was also a difference in the settings for the open book and the open cube both with and without binoculars. The open cube was set more nearly at right angles than the open book. This possibility showed the influence of the open book as an "ideal" real object, R. As was said previously, however, the open cube possessed more angles to be used in the perception, and this difference might have been influential.

Discussion. It should be pointed out here that my interest in the flattening effect or instrumental magnification is not confined simply to understanding the effects of binoculars and similar magnifying instruments. It consists rather in considering the broad principles required for explaining perceptual performance wherever found. Therefore, rather than going into detail here with regard to quantitative results, some discussion of principles will be made.

In addition to the principle of *phenomenal regression*, brought into the problem through Thouless's work, the present experimental situation and the prefatory examples illustrate several pervasive principles of perception, some of which have not as yet been recognized in a formal way in the literature. I have reference to the principles of *geometric equivalence*, *constancy*, and *internal-consistency*. Of these, only constancy has been given formal recognition.

The principle of geometric equivalence is simply that objects of various shapes and sizes may produce the same, or shall we say equivalent, images upon the retina. Since this is the case, the organism does not always receive stimulation from a single object that can lead to only one end-result, it is left with the problem of selecting one out of the many possibilities. The mechanisms that are involved in this selection constitute some of the basic processes of perception.

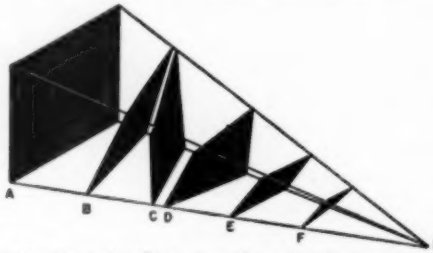

Fig. 3. Diagrams to show the effects upon the retinal image when a tilted plane figure (occupying three visual dimensions) is brought closer to the eye and when the image is magnified by instrumental means. In both this figure and in Figure 2, a reduction of the apparent third dimension is illustrated.

Geometric equivalence may be exemplified by examining Figure 3. In it, you will note that a number of surfaces, each differing from the others in size, shape, distance from the observer, and in orientation to him, all subtend the same over-all visual angles. Barring any other object in the visual field to aid in determining which of the several objects is the one being viewed, each of these surfaces are visually perfectly equivalent to the others. The observer is left to see whichever one

that conditions within him dictate. For example, in the case of the ellipses, the over-all visual angle subtended could be the same for the retinal image produced by bringing the object closer and for magnifying it instrumentally. This would be a nondifferentiating aspect of the two situations, a matter of geometric equivalence. Only if and when differences in asymmetry in the images in the two cases come into play could differences in tilt result in perception. As a further example, in the case of the cube, with the very same over-all geometrical conditions holding, some cubical objects do not appear flattened. It has been shown that if the cube is a clock tower, or a bandbox, it will retain its original third dimension. It will be compelled to change in ways that the simple cube did not. The significance of this will be implied a little later in discussing internal-consistency.

The organism confronting equivalence in the physical situation acts in certain lawful ways to cope with it. These include such principles as constancy and internal consistency.

Constancy operates with reference to various object-properties, hence there are several kinds of constancy, such as size-constancy, shape-constancy, color-constancy, and lightness-constancy. The term constancy refers to the tendency to see an object as possessing the same properties despite varying physical conditions under which it is presented. For example, a so-called white sheet of paper looks white even in very dim illumination. It appears to be much lighter than a piece of coal that is seen as black, even in strong illumination. This occurs even when the coal is reflecting more light per unit surface to the eye than the sheet of paper. Constancy, even in a relative rather than absolute sense is a factor that is involved in the maintenance of identity. Different perceptual results are to be expected in many cases when the observer has a basis for knowing what it is that he is looking at than if he did not. In any case, the retinal pattern provides for seeing a thing or things. Relative constancy of properties go along with identification of *things*.

As already pointed out, consistency is a fundamental feature of perception. This is the case, although the specific perception that is elicited by any given set of external physical condition may vary from time to time.

In perception, the functional significance of each of a number of factors is dependent upon the role by every other factor. In such a situation one might wonder how a perception could ever occur, for the matter would be like a number of people considering the achievement of a cer-

tain result, but could not come to any agreement upon which role each one of the group would play. In such cases, action generally evolves from some one person assuming a role. When this occurs, the roles of others develop. In the process of reasoning certain factors assume the role of premises. When once the premises are determined, the consequences follow. In a syllogism, we say that granting such and such to be the case, and something else also to be true, then a third thing is true. It is a process of closing in. Looked at subsequently, there seems to be a compulsory interrelation between the roles played by the various factors. In some situations this relationship is such that it is not apparent which factors are the premises, and which the conclusions. The relationship works in all directions. It is apparent, however, upon reflection that in any given case some factors must play the lead, or act as premises or references for the others. Naturally our primary problem in perception is to explain the results obtained in our experiments. It has become apparent that to accomplish such explanations or understandings the internal-consistency of perception is one of the properties to recognize and utilize. In doing this, the syllogistic nature of perception is to be assumed, and a determination of the premises involved in a response is one of the first procedures in making rime and reason out of otherwise inexplainable results.

To explain what is meant by premises in perception, we refer to a simple demonstration. Take a rectangular card in a room darkened so that nothing but the card upon which some light is directly projected is visible. Ask observers who do not know the size of the rectangular object or how far away it is a question regarding its distance. If we ask them to tell us how far away it is, the observers may be expected to give different answers. Our problem is to make rime and reason out of this, if we can. Any single observer may have difficulty in seeing the object in such a way as to report with confidence regarding the real distance, or even the distance at which he sees it. How can we explain such results We can get a pretty good clue to all of this if we determine *what* the observer took the rectangle to be. For example, it might have been taken to be a 3x6 filing card, a small calling or business card, or even a very much larger blank surface. If the observer saw the rectangle as a calling card, it was seen at one distance; if a larger filing card, it was seen farther away. If a still larger object, it was seen as still farther away. Anything that helps determine what it is helps determine its position and anything that interferes with the observer taking it to be a given object or settling upon some object precludes the localization of the card at any place definite enough to

be reported upon. The assumed size or identity of the object was the premise for perceiving distance. Whereas the perceptual problem in this demonstration was that of reporting upon *distance*, or location, it could just as well have been that of reporting upon size, and then distance would have been one of the premises. This implies that perception is a type of problem-solving performance. In this it is like thinking, except that one is drawn out in point of time and the other is immediate. When once we recognize this, we see that perception is internally consistent regardless of how it looks in relation to stimulus conditions. Thus, although we obtain a wide variety of results in our investigations or in our daily practices, we avoid confusion and mystification in trying to understand them.

Much more could be said in applying these principles to the understanding of the present consideration of the flattening effect, but what has been provided ought to enable any one to carry the matter on as far as he likes.

ABSTRACTS

CONVERGENCE DEFICIENCY. An Investigation into the Results of Treatment. A. Mellick. Brit. J. Ophth., 34(1). 41-46. Jan., 1950.

The author discusses the various factors that are involved in cases of poor convergence.

While the general health, fatigue, and psychological state of the patient are important factors and need to be considered, nevertheless, the majority of writers agree considerable immediate benefit can be obtained in a large number of convergence deficiency cases by orthoptic exercises.

The results of treatment of 88 cases of convergence deficiency are described. The question is raised, and suggestions are made for further research, relative to what extent convergence deficiency is a psychosomatic manifestation.

R. E. B.

ELIMINATING DISTORTION DUE TO PRISMS IN GLASSES. Paul W. Miles. American Journal of Ophthalmology. 34(1). 87-93. Jan., 1951.

Because of distortion, defective space perception and discomfort, the use of strong prisms has often been discouraged. Base-out prisms cause flat surfaces to appear concave and base-in prisms have the opposite effect.

Ames in 1932 made experiments using prisms on deep curves and Ogle made calculations and subjective horopter tests on prisms of various curves. By means of ray diagrams, Miles has prepared tables giving for various prisms powers front and rear surface curves that correct the distortions in two meridians.

Miles suggests that it might prove a useful measure for treatment of concomitant phoria or moderate tropia if strong prisms could be worn comfortably without metamorphopsia.

R. E. B.

THE RELATIONSHIP OF PROXIMAL CONVERGENCE TO FUSIONAL AND ACCOMMODATIVE CONVERGENCE*

H. W. Hofstetter†
Los Angeles College of Optometry
Los Angeles, California

INTRODUCTION.

In a previous article[1] it was demonstrated that a convergence response could be elicited by the awareness of nearness of a fixation object independent of the actual dioptric stimulus to accommodation and/or convergence. It was further demonstrated that this convergence response was not an accommodative convergence manifestation of the possible changes in accommodation induced by the awareness of nearness.

In a more recent article by Ittelson and Ames[2] data were presented to show changes in both the accommodative and convergence responses with changes in the perceived distances of a test object. The perceived distances in their experiment were effected by changes in apparent size of a familiar test object, wherefore it may reasonably be suspected that the perceived distance was the essential factor producing the responses. Ittelson and Ames, however, failed to make allowances for the accommodative convergence associated with the induced accommodative responses. In a subsequent analysis of their data by this author[3] it was made apparent that although they obtained significant accommodative responses to the awareness of nearness, their simultaneous convergence responses were entirely attributable to the A. C. A. ratio; i.e., the convergence normally associated with accommodation.

These and other experiments serve to indicate that the phenomenon called proximal convergence and the phenomenon called proximal accommodation are, per se, independent of each other. On this assumption, namely, that the proximal convergence responses are not subserved by the proximal accommodation responses, or vice versa, or even by a mutual mechanism, there then arises the question of the relationship of proximal convergence to other operationally classified types of convergence. The present investigation is concerned specifically with its relationship to fusional convergence and accommodative convergence. That is to ask, is the convergence response to the awareness of nearness

*Read before the annual meeting of the American Academy of Optometry, Chicago, Illinois, December 17, 1951. For publication in the June, 1951, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist, Dean of College, Ph.D., Fellow, American Academy of Optometry.

influenced by the amount of fusional or accommodative convergence in play?

Except for slightly varying terminology, the concepts of proximal, fusional, and accommodative convergence employed in this discussion are identical to those routinely employed by Fry,[4] Morgan,[5] Neumueller,[6] and most others, and may be stated briefly as follows:

Proximal convergence: Convergence changes induced by changes in perceived distance or apparent proximity of the fixation object.

Fusional convergence: Convergence changes occurring as responses to disparate retinal stimuli, i.e., images falling on non-corresponding retinal points.

Accommodative convergence: Convergence changes associated with changes in accommodation.

EXPERIMENTAL PROCEDURE.

Measurements were made on 21 volunteer subjects, most of whom were optometry students, ranging in age from 20 to 41 years, with a mean age of 23. Except for one 41 year old subject (W. H.), the age would have been from 20 to 27 with a mean of 22.5 years. All of the tests were made by the author. All of the subjects were correctible to 20/20 acuity or better, and none showed evidence of strabismus. The ametropias ranged from +2.75 diopters to —3.62 diopters with an equal number of myopes and hyperopes. The highest astigmatic correction was 2.75 diopters.

The equipment included a floor-stand type phorometer trial frame with test-lens cells, removable rotary prisms, and a test-card holder. The lens cells were adjusted for the subject's distant interpupillary distance for all tests and were so placed in front of the eyes as to make the posterior lens cells correspond with the subject's spectacle plane, which was assumed to be 14 mm. anterior to the corneal apices. The simplest available combination of lenses representing the formula for each subject's distance correction, combined with auxiliary lenses used in the experiment, was inserted with the lens of greatest power in the cell nearest the eye, and with the lenses of less power in the immediately adjacent cells. For practical purposes the arithmetic totals of the lens powers could then be regarded as the total lens power effective in the spectacle plane.

The rotary prisms were mounted effectively at a distance of 25 mm. anterior to the spectacle plane. On the assumption of a distance of 13 mm. from the center of rotation to the corneal apex, the rotary prisms were therefore effectively 52 mm. anterior to the centers of rotation of the subject's eyes.

Two test charts were alternately used, one at 6 M. and the other at 33.3 cm. from the spectacle plane, mounted at eye-level in the median sagittal plane of the head. The chart at 6 M. consisted of a single row of 20/25 Snellen test letters. The near chart contained a row of letters reduced in size so as to require approximately the same acuity at 33.3 cm.

The testing conditions were arranged in the following sequence:

Distance of Test Chart	Spherical Lenses Combined with the Distance Correction
6 M.	0.00
6 M.	—1.00
6 M.	—2.00
6 M.	—3.00
33.3 cm.	0.00
33.3 cm.	+1.00
33.3 cm.	+2.00
33.3 cm.	+3.00

For each of the above sets of conditions the following tests were made in the sequence shown:

1. Lateral phoria
2. Base-in limit of clear single binocular vision
3. Base-out limit of clear single binocular vision
4. Lateral phoria
5. Base-out limit of clear single binocular vision
6. Base-in limit of clear single binocular vision
7. Lateral phoria

The phoria tests were made by placing eight prism-diopters base-down in front of the right eye and adjusting the horizontally oriented rotary prism back and forth in front of the other eye until the two images of the test chart were reported vertically aligned. During the test the subject was instructed to fixate the upper image continuously and to keep it clear. Only findings obtained while the image was clear were recorded. This often meant considerable waiting and coaching until the subject was able to accommodate or relax his accommodation sufficiently to see the letters clearly. At all times the subject was aware of the actual distance of the test chart.

The base-in and base-out limits were obtained by placing the horizontally oriented prisms so that the total amount of prism base-in or base-out corresponded to the preceding phoria reading, and then increasing the total prisms slowly base-in or base-out until the subject reported blur or diplopia, whichever occurred first. To minimize the possibility of spurious blur or diplopia the subject was given a few

seconds to attempt recovery from blur or diplopia as soon as he reported it. If recovery from blur or diplopia was not possible with this second effort the prism reading was recorded as the prism base-in or base-out limit of clear single binocular vision. As in the case of the phoria tests it was often necessary at the outset of each test to await the clearing of the letters before a measurement was started. Also, as in the other tests, the subject was made aware of the actual distance of the test at all times.

Inasmuch as each of the prism readings represented the convergence effective in the plane of the rotary prisms, it was necessary to correct each finding for its effectivity at the centers of rotation of the eyes. This meant taking into account the subject's interpupillary distance, the distance from the center of rotation to the lens cells, the distance from the center of rotation to the rotary prism plane, the distance to the test chart, and the dioptric power in the horizontal meridian of the lenses in the lens cells. To compute the prism power effective at the center of rotation, a formula was derived in the manner described by Haines.[7] From this formula nomographs were designed to facilitate rapid correction of each of the prism findings.

For each set of testing conditions the three phoria findings, the two base-in findings, and the two base-out findings were separately corrected, averaged, and plotted for each subject on accommodation-convergence graphs. The graphs for the 21 subjects are shown in Figures 1, 2, and 3.

Because all of the tests on the 21 subjects were made in the fixed order stated rather than in random order, two subjects were subsequently tested in precisely the reverse order. Their results appeared essentially typical of the 21 reported here and seemed sufficient to indicate that the order of testing was not a factor in producing the effects identified here as proximal effects.

RESULTS AND DISCUSSION.

The data for the 21 subjects are plotted in Figures 1, 2, and 3. In these figures the solid lines represent the measurements made with the test object at 6 M., and the broken lines represent the measurements made at 33.3 cm. Except for some interlacing apparently attributable to normal testing error, it may be seen that the broken lines are characteristically displaced to the right of the solid lines. This displacement represents the proximal convergence associated with a change in the apparent distance of the test object from 6 M to 33.3 cm.

This displacement is least for the base-in limits of clear single binocular vision, a few cases (M. A., W. B., C. C., V. E., R. G.,

Fig. 1

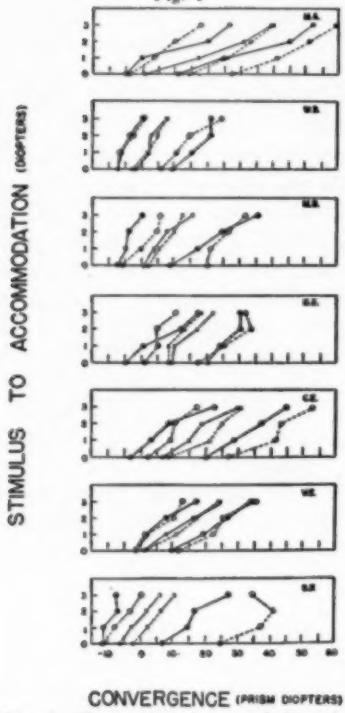

Fig. 2

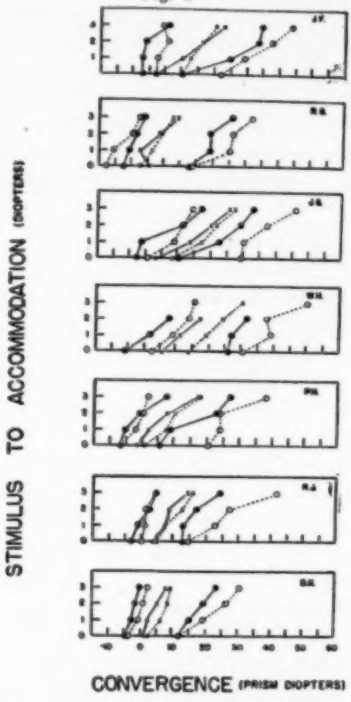

Fig. 1. Convergence-accommodation plots of the data of seven of the 21 subjects. The solid lines connect points representing findings made with the test chart at 6 M. The broken lines connect points representing findings made with the test chart at 33.3 cm. The x's represent phorias, and the circles represent base-in and base-out prism limits of clear single binocular vision. The convergence data are corrected for effectivity at the centers of rotation. The accommodation data correspond to effectivity at the spectacle plane. Zero convergence represents parallelism of the lines of sight.

Fig. 2. See legend for Fig. 1.

and P. H.) showing slightly negative displacements. Of these, M. A., and R. G. show rather pronounced negative displacements which remain unexplained, except to assume that the subjects changed their criteria during the procedure or in some other uncontrolled manner introduced a testing error.

The displacement is greatest for the base-out limits, only one (W. B.) showing a negative displacement.

The phoria lines show the same direction of displacement to a

Fig. 3

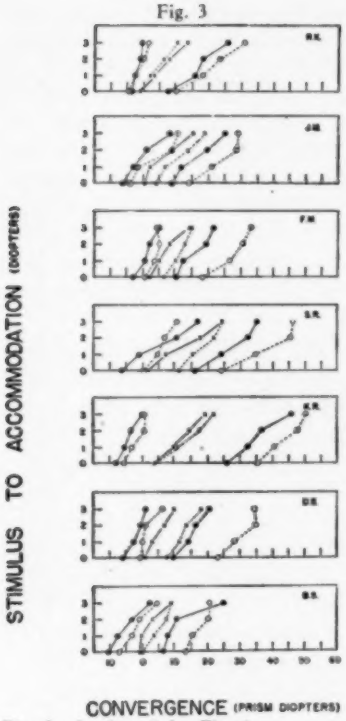

Fig. 3. See legend for Fig. 1.

Fig. 4

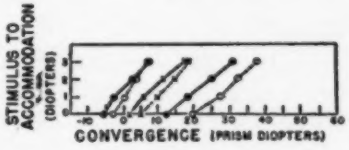

Fig. 4. Statistical composite of data in Figures 1, 2, and 3.

somewhat greater extent than the base-in limits, and to a less extent than the base-out limits, with two subjects (C. C. and R. K.) showing a slight negative shift.

No subject showed negative displacement for all three sets of measurements.

These observations are more apparent in the composite graph of Figure 4. This graph represents the averages for all 21 subjects. In this figure the average displacements of the base-in, phoria, and base-out lines are 1.5Δ, 2.6Δ, and 7.6Δ, respectively. The shift of 2.6Δ in the phoria line compares favorably with the shift in the phoria line obtained in a previous experiment[2] in which the actual accommodation and convergence responses were measured instead of the stimulus values employed here.

This serves to indicate that the present measurements are reasonably valid in spite of the increased depth of focus error permitted by this technique.

The part the fusional convergence plays can be derived indirectly by the relative shifts of the base-in, phoria, and base-out lines. If fusional convergence is regarded as a continuum from the base-in limit to the base-out limit, then the three sets of lines represent different amounts of fusional convergence in play. On this basis it can be inferred that proximal convergence is closely tied up with fusional convergence. If proximal convergence were an entirely independent variable, the shift would be expected to occur equally at all three fusional convergence levels.

If fusional convergence is assumed to be made up of two components, namely positive and negative fusional convergence, measured to the right and left of the phoria line respectively, the possible mechanism subserving the relationship between proximal and fusional convergence is not easily imagined . But if the total range of fusional convergence is regarded as a single continuous function, then it appears that the awareness of nearness serves as a facilitating stimulus, or even as a de-facilitating or inhibitory stimulus if the stimulus is identified inversely as the "awareness of distance" instead of the "awareness of nearness." In other words, the convergence responses to changes in perceived distance cannot be expressed adequately as an isolated amount of convergence to be added to or subtracted from fusional convergence, but rather it probably should be expressed as an algebraic modifier of fusional convergence.

The fact that a small amount of proximal convergence is present at the negative limit of fusional convergence, i.e., at the base-in limit, permits the converse argument that proximal convergence is, instead, a discrete function modified or facilitated by fusional convergence. The critical test lies in the ultimate determination that the small amount of proximal convergence obtained at the base-in limit is or is not real. The data reported here are not sufficiently precise to settle this question.

Whichever may be the case, it is interesting that the concept of facilitation is not unique in considerations of oculomotor functions. In a study of pupillary changes with accommodation and convergence Knoll[8] observed, ". . ., that the effect of fusional convergence upon pupil constriction is greater at the higher levels of accommodative response than at the lower levels." This is, of course, only an analogy, but it nevertheless points up a subtle relationship that possibly needs

more consideration in the analysis of oculomotor functions.

A comparison of the total base-in to base-out range at 6 M. with the increase in range at 33.3 cm. in each of the 21 subjects shows no correlation. In other words, the range of fusional convergence possible in a given subject offers no clue as to the amount of proximal convergence to be expected, or vice versa. This implies that although one function may serve as a modifier of the other function, the two functions are nevertheless initially independent, or at least have clearly independent origins.

Another observation to be made is that the lines in Figures 1, 2, 3, and 4 remain essentially parallel. This means that the proximal convergence was not influenced by the amount of accommodation or accommodative convergence present.

A careful inspection of the data does not disclose any significant correlation between the slope of the lines (the A. C. A. ratio) and their displacement (proximal convergence) as was suspected earlier by this author[1] and apparently proved in a recent paper by Morgan.[5] Morgan's conclusions were based on the observation of a correlation between accommodative-convergence measured by the gradient technique and proximal convergence measured as the "Accommodative convergence by phoria *minus* accommodative convergence by gradient." It is very possible that his correlation was a statistical artifact depending on the use of the same gradient data in computing both variables in the correlation formula. On this assumption, the present data may be taken to indicate that there is no relationship between accommodative and proximal convergence.

SUMMARY AND CONCLUSIONS

Measurements of the lateral phorias and the base-out and base-in prism limits of clear single binocular vision were made on 21 adult subjects, with varying amounts of dioptric stimulus to accommodation and at two different test chart distances (33.3 cm. and 6 M.). The subjects were continuously aware of the actual distance of the test charts.

Analysis of the data indicates that the differences in actual, and therefore perceived, distance of the test chart induced convergence responses independent of the responses attributable to changes in accommodation. The induced convergence, identified as proximal convergence, was least apparent in the base-in prism findings and most pronounced in the base-out prism findings. This was interpreted to mean that proximal convergence is closely associated with the amount of fusional convergence in play. However, there was no correlation

between the total range of fusional convergence possible and the proximal convergence manifested in the individual subjects. This was interpreted to mean that proximal convergence and fusional convergence have independent neurological origins.

In the 21 cases there was no significant correlation between the A. C. A. ratios and the amounts of proximal convergence manifested.

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ABSTRACTS

ANOMALOUS CORRESPONDENCE. Marjorie V. Enos (Discussion by Michel Loutfallah). American Journal of Ophthalmology. 33(12). 1907-1916. Dec., 1950.

Miss Enos, an orthoptist, covers the definitions, terminology and classifications of anomalous correspondence. She presents statistics showing an overall average of anomalous correspondence in 47.5 per cent of strabismic cases. The question of whether anomalous correspondence is congenital or acquired is considered; also the methods of testing by the major amblyoscope, the after-image test and double-image tests.

The treatment of anomalous correspondence on the major amblyoscope may include retinal massage, flashing, etc. The use of complete occlusion of one eye during orthoptic treatment is highly recommended.

In the discussion, Dr. Loutfallah commends Miss Enos' presentation and rationale. He feels that the judicious combination of orthoptics and surgery is an invaluable asset, and stresses the value of post-operative training. He comments on the deleterious effect on the patient's attitude of gratuitous training.

R. E. B.

INDUSTRIAL VISUAL SCREENING*

W. T. Cameron†
Southbridge, Massachusetts

Three groups have an interest in industrial visual screening. Industry, the professions specializing in visual care, and the manufacturers of vision testing equipment and ophthalmic materials. The first of these groups, industrial management, is becoming more and more interested as evidence piles up, proving that the visual status of employees bears a measurable relationship to quality and quantity of production and to the avoidance of accidents. The second group, the visual care professions, are perhaps the most intimately concerned as it is they who must furnish the leadership and the corrective measures. It is they who will lose if non-professional schemes are permitted to replace professional direction and participation.

The third group, manufacturers of vision testing equipment and ophthalmic materials, can be divided into three categories:

a. The optical companies that supply ophthalmic materials to the professions and safety products to industry, and who in addition manufacture screening instruments and are promoting a vision testing plan.

b. The manufacturers (and fabricators) of ophthalmic materials that do not have screening devices or promote screening programs, but who profit from the promotional and educational work of others.

c. Screening device manufacturers that have no direct relations with the professions but that do sell screening instruments to industry (and to other groups) for mass vision testing purposes. Because this group has no defined relationship to the professions, its activities are, in the writer's judgment, often not in the best interests of the only groups legally, professionally, and technically qualified to render eye care: ophthalmologists, optometrists and ophthalmic dispensers.

Group-vision-testing techniques are not all of recent origin, in fact some are quite old. Among the systems in use today are Snellen and Jaeger charts, illuminated test cabinets, several models of the Keystone

*Read before the New Jersey Chapter, American Academy of Optometry, Trenton, New Jersey, as one of a series of lectures on occupational optometry. For publication in the April, 1951, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Member of Industrial and Safety Department staff, American Optical Company.

telebinocular, the Massachusetts vision testing kit, the Los Angeles County Optometric Association kit, the Kindy Optical Company screening device, the B. & L. orthorator, and the A. O. sight-screener. In addition, there are various short-cut professional techniques available directly to industry from individual practitioners, designed for "quick testing" rather than for diagnostic purposes.

Before proceeding further, it might be well to define the term "industrial visual screening."

The word *"screening"* taken alone and as used in the field of psychological testing consists of a separation, or classification process by which persons meeting pre-determined levels of attainment are separated from those who fail to reach the established levels. To many employees, and to unions, "screenings" is an emotionally toned word. This derives from the dictionary implication that screening separates desirable from waste material, and from the one-time practice of dismissing older workers, "agitators" or physically sub-standard employees, under the guise of a "screening system" allegedly introduced for some other purpose.

Screening, in combination with the word "visual," has taken on a variety of meanings determined, to a large extent, by the action taken on the results of an initial (or periodic) "check-up" on the visual performance of groups of persons, as in schools, industry, etc. Visual screening differs from standard refractive procedure in several important respects, the principal one being that visual screening is non-diagnostic in character, is done quickly, and is used in group, rather than in individual, situations.

Industrial Visual Screening, is probably the oldest form of group testing of visual performance. The first, and still the most prevalent type of industrial visual screening, is that which is carried on in an industry's employment or medical department as part of a pre-employment or pre-placement physical examination. The visual testing device may be no more than a Snellen chart, or may include one of the several commercially available industrial vision testing instruments. Based on the results of the general medical findings, including vision, the job applicant is either employed or rejected. The "standard of acceptance" depends upon the social consciousness of the industry and the current status of the labor market. These standards of acceptance vary from plant to plant and from time to time in the same plant. A more recent variation of this basic concept is the "selective placement" of applicants with physical (or visual) limitations in jobs where their disabilities will not interfere with their performance of, or safety on, the job.

A by-product of pre-placement vision testing is the establishment

of a record of the visual capabilities of the newly-hired employee (both with, and without glasses) which may prove valuable at some future date should a claim for eye injury compensation be entered against the company.

A recent development in the field of selective placement is the attempt to develop precise job *visual* standards for each and every job classification against which an individual's level of visual performance can be compared. When considering this use of group vision testing, it should be kept in mind that previous levels of "pass" or "fail" have been more or less arbitrarily established, based upon someone's opinion, often no more than the casual acceptance of an instrument maker's idea of the vision needed for various broad classes of work.

Under this system, the job visual standards are determined by testing (with one of the industrial vision testing instruments) all of the employees engaged in the same occupation. Visual scores of the group are then checked against the various criteria of job performance, such as piece rates, spoilage records, dispensary visits, supervisor's opinions, etc. The composite visual score possessed by the majority of "superior" employees, but not possessed by a substantial portion of "inferior" employees, are concluded to be the desirable visual standards for the occupation in question.

The individual score of an employee (or of a job applicant) is then compared with the standard. Those who do not meet the standard are either placed on jobs requiring a lower standard of visual performance or are told to seek professional assistance in attaining the level of skill called for.

While this method of industrial visual screening has been used successfully by trained industrial psychologists, working in close cooperation with members of the ophthalmic professions, it is possible for the uninitiated to arrive at naive and erroneous conclusions. Visual peculiarities which develop through continued application to an unnatural visual task are often assumed to be desirable skills. For example, it was found in an early study of the visual scores of milling machine operators that the "superior" employees had right hyperphoria and it was concluded that this condition was a visual "skill." However, anyone who has observed the posture of a milling machine operator will realize that the condition should more rightfully have been classified as an "occupational disease."

By the same token, one might conclude that nystagmus is a coal miner's "visual skill" because many old-time operators have it, or that myopia makes for high academic grades in college because some of the best students are near sighted.

It should be kept in mind that most jobs in industry do not require a particularly high level of visual efficiency. Further, that on other jobs, only one or two of the many visual skills correlate with job performance, for instance, near point acuity in hosiery loupers. It is, therefore, entirely possible to have a large proportion of a company's employees meeting the *job* level of visual performance but at the same time acutely in need of visual attention from the standpoint of *personal* and general visual efficiency and comfort. Furthermore, standards established by this method do not take into consideration the necessity of the employee to get to and from work, to move around the shop, to function as a "whole man" and not an automaton tied to a machine. Being told that his vision is "adequate for the job" often keeps an employee in the dark on the possibility of better seeing for every day living. As far as I know, there is no such thing as vision that is *too* good for the job.

A more realistic approach is through an industrial visual screening program which places the emphasis on *corrective visual care* and uses a screening device and technique only as a means to this end. This concept is based on the premise that any employee who is functioning below his highest potential level of visual efficiency will be a safer, healthier and happier employee (and often a better producer) if he is given the benefit of professional care regardless of the requirements of a particular job. Such a plan makes provision for testing job applicants, but more important it includes an initial and periodic visual check on currently employed persons, with those who could benefit by an examination so advised.

To assure the utmost in success, this type of program should be professionally directed with the determination as to who could benefit by professional care (and equally important, who could not) a responsibility of the medical or optometric professions. The screening instrument may be operated by a non-professional person (and even an initial separation of record cards made under standards established by the doctor) but the final responsibility rests with the professional man in charge.

This basic program, alone, will solve about 90 per cent of industry's vision problem. It may be extended, however, to include studies of the environment with the view of increasing visual perception: job studies for the purposes of recording visual movements and postures, which will be helpful to the employee's practitioner in prescribing for personal and job needs. It may include studies to determine the minimum levels of visual efficiency required on various jobs for the purpose of utilizing, wherever possible, persons with uncorrectible visual handicaps. Recent studies in this direction have turned up occupations which

run the gamut from jobs which require no vision whatsoever to those requiring a high level of visual performance or some exceptionally well developed visual skill. It should be borne in mind that unlike some other aptitudes, visual patterns can be altered, and visual skills improved, through readily obtainable professional attention.

The installation and administration of an industrial visual screening program of this type requires careful planning and definite scheduling. Following the appointment of a doctor to direct the program and the selection of an instrument and necessary printed materials, the visual efficiency program proceeds along the following lines:

STEP 1. SELECTION AND TRAINING OF TECHNICIAN, IF ONE IS TO BE USED

Under theoretically ideal conditions the responsible practitioner would wish to see personally every employee whose vision is to be checked, but because this is often neither practical nor economical, a technician may be selected to operate the instrument, ask the questions, and record the employees' answers. The professional man in charge of the checking program should assist in the selection and training of the technicians, for, although the technician may be an employee of the company with other duties, he will be considered responsible to the practitioner while connected with the vision program.

Before attempting routine checking, the technician should become thoroughly familiar with the instrument, the record card, the other aspects of his duties. He should practice the checking procedure on a small selected group of persons and as rapidly as possible learn to ask the questions and go through the routine without reference to the manual or to notes. The doctor responsible for the program should carefully check the technician's performance before formally launching the program. Instructions to the technician should include the doctor's wishes in regard to the procedure for transmitting the completed record cards at stated periods for his professional analysis and evaluation of the test scores.

STEP 2. PRELIMINARY SCHEDULING

A schedule should be developed indicating the order in which various departments within the plant are to be handled, the length of time to be spent in each department, and where the checking stations are to be located.

A location should be selected which assures comparative privacy to the subject being tested, preferably a room separate from the waiting room, or at least detached as far as possible from those waiting for check. Seating arrangements will need to be provided for the employee

and operator, and an orderly method worked out for handling the employees and the necessary paper work.

The instrument should be demonstrated for, and the objectives of the plan explained to, departmental superintendents and foremen. The schedule should be discussed with them and an orderly method of getting employees to the checking stations decided upon.

STEP 3. ENLISTING COOPERATION OF EMPLOYEES

As is often the case in programs involving personnel matters, some employees may not understand the company's motives or may object to submitting to the check for fear of losing their jobs, or of being transferred to less desirable jobs at lower pay. It is, therefore, important that employees be notified in advance of actual checking and their questions anticipated and answered. There are a number of ways in which this advance notification can be handled to insure the enthusiastic endorsement and cooperation of the employees. Perhaps the best method is through the medium of a personal letter from the appropriate official in the company. This letter may be sent to the employees individually or posted on bulletin boards. An article in the company house organ or employee publication, describing the plan and possibly picturing the instrument in operation, will prove helpful. Bulletin boards offer an excellent medium for announcing the program and it is often desirable to post a notice indicating the joint approval of management and employee representatives where a labor-management committee or a safety committee has discussed the program. Employees who still object to taking the check or who have further questions to ask, should be requested to visit the personnel, medical, or safety departments for a personal interview.

STEP 4. CHECKING OF EMPLOYEES

The routine checking is now started, the instrument being taken from department to department, where it is set up in the foreman's office, or other location near the employee's work, as outlined in the schedule.

When the employee is seated, and prior to checking, the top of the record card is filled out by the technician. Where it is desirable, a clerk may do this before the employee reaches the instrument, or some other arrangement for promoting speed may be used. But in any case, the technician must confirm identity of employee with the name and the number on the record card. When these preliminaries are completed, the technician proceeds with the actual checking, following the proper technique of questioning the employee and recording his answers.

STEP 5. PROFESSIONAL ANALYSIS

At stated periods, the technician transmits or delivers the record cards to the practitioner for his analysis and evaluation. The professional man indicates in the space provided on the record card the score made by each subject which with professional evaluation facilitates determination of whether or not the employee has adequate vision uncorrected, satisfactory vision with present glasses, or needs an eye examination and complete professional care. *The guiding principle here is that each employee should be referred for professional attention if he falls significantly below his highest potential visual level, regardless of job.*

STEP 6. NOTIFICATION TO EMPLOYEES

It is important that employees be given the results of their vision check in general but not diagnostic terms, together with any recommendations, with as little delay as possible. This notification may be given in person by the doctor, by a representative of the plant management, or may be transmitted to the employee by the management rather than by the doctor because of the direct employer-employee relationship which already exists. Where the worker is advised of such results, or given instructions in regard to eye care by management, such instructions and advice should be based upon the interpretation of the responsible practitioner.

STEP 7. PROFESSIONAL ATTENTION

Depending upon the plan selected for providing professional services, those employees shown to be in need are given the proper direction either by notice or through personal interview. If the employee is to be examined by a practitioner unfamiliar with the job visual demands, it is desirable to provide him with a special form on which is noted such information as specific work distances; whether or not the work is above or below shoulder level; the illumination at the job in foot candles and whether the illumination is artificial or daylight. In addition, the protection requirements which are to be incorporated into a corrective-protective goggle (should the results of the examination indicate the need for a correction) should be transmitted to the examining doctor.

Industrial visual efficiency cannot be divorced from eye protection. Flying chips, splashes of corrosive material, glare and injurious rays are a constant threat to visual efficiency, and an industrial vision program is not complete until all hazardous jobs have been analyzed to determine what eye protection is needed.

STEP 8. VISUAL PERFORMANCE RECORDS

The permanent file covering employee's visual capabilities is developed from two sources, first, for those shown not to be in need of

professional attention, the data from the original screening record card, are used. Second, for those employees referred for attention, the record is based upon the employees' visual capabilities at their corrected level, as supplied by the examining doctor.

STEP 9. PERIODIC RECHECKING

Provision should be made for periodic rechecking of employee's vision. Visual functions vary with age and with environment. Visual performance does not remain static. Professional men have declared that, because of normal changes which take place as age advances, vision should be checked at definite, regular intervals. Employees should be rechecked at least every two years, oftener if possible. In addition, it will be found desirable to check the vision of employees whose workmanship is poor, who are slow to learn new tasks, or who are accident prone, when seeking the cause of their unsatisfactory performance.

Some 350 companies and government manufacturing establishments are now conducting programs of this type. The benefits of a professionally conducted periodic visual check-up, with proper visual care for those in need, have thus been extended to nearly a million workers. Reports from many of these companies speak in glowing terms of improved morale, increased production and fewer accidents. Professional men associated with these programs are equally enthusiastic for they have the satisfaction of *participation*. The New Jersey chapter, American Academy of Optometry and the committee that conceived and carried through on this course of lectures are entitled to praise for their contribution to better vision for industry.

ABSTRACTS

VISUAL ACUITY WITH BRIEF STIMULI. L. C. Martin, D. J. Day, and W. Kaniowski. Brit. J. Ophth., 34(2), 89-104, Feb., 1950.

The authors state that although the visual acuity of the eye has been investigated frequently, it has not been examined fully under conditions of limited exposure time. The experiments described were intended to increase the range of intensities beyond those for which measurements of flash visual acuity have already been made. Double-star and Foucault-grating test objects were used, with dark-adaptation and low light-adaptation respectively. Exposure times of less than one second were used.

The limiting angles of resolution were found to be small (often less than one minute) under medium intensity stimuli, and they do not suggest that eye-movements have any major effects in improving acuity. The effects of "over-exposure" with high-intensity flashes were studied, and some possible related physical and chemical processes in the retina were suggested for discussion.

R. E. B.

SOME ASPECTS OF THE PSYCHOLOGY OF BINOCULAR VISION*

Rt. Hon. Lord Charnwood†
London, England

I believe that it was Helmholtz who, in childhood, asked his mother to reach him down one of the statues on a tower in Potsdam, believing it to be a figurine only just beyond his own reach. Much has been made of this story in support of the empirical view of space perception of which Helmholtz, himself, was a protagonist.

It seems interesting to me to contrast this story with the familiar phenomenon of size constancy. Here we have the crux of a problem over which endless ink has been spilt for centuries. I am not going to add much to that ocean of ink, for I consider the problem has been finally liquidated here in America.

Tschermak[1] drew up what is perhaps the most precise formulation of the requirements of any theory of binocular vision, even though he phrased it most obscurely. At about the same time, psychologists here in the United States, in England, and elsewhere, were striving to build up a picture of the mental processes involved. Despite the fascination the mystic word Gestalt has for many, I find it difficult to regard the result as anything but a patchwork. Then, three years ago, the Dartmouth Eye Institute published Luneburg's, *Mathematical Analysis of Binocular Vision.*[2]

I shall not attempt to deal fully with this, for Dr. Paul Boeder has already accomplished this at one of these meetings far better than I could ever hope to. I shall, however, detain you for a few minutes while I try to show you why I consider that that paper has disposed, finally, of most of the classic problems of the psychology of vision.

To do this I must briefly review the evidence that Luneburg used to test his theory. We have known for a long time that the horopters are not straight lines, nor are they Weith Müller circles. Blumenfeld, following Hillebrand, has shown that the instruction to place a set of vertical strings at equal distances apart on either side of the median plane is not equivalent to telling the subject to arrange them in two straight parallel walls. We have already noticed the size constancy phenomenon.

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*Read before the annual meeting of the American Academy of Optometry, December 17, 1950. For publication in the June, 1951, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.
†Optometrist. Fellow, American Academy of Optometry.

Luneburg proved that visual sensations are amenable to mathematical treatment and proceeded to deduce the metric of visual or subjective space. Using only the size constancy phenomenon to decide between the limited choice available he concluded that our visual space is the Reimannian space of constant negative curvature.

He next proceeded to show that the horopter lines that have caused so much worry in the past are geodesics of this space, the equivalents of the straight lines of Euclidean space, mapped out in Euclidean space. Again it is only in Euclidean geometry that equidistant and parallel mean the same thing. In hyperbolic geometry the equidistance curves lie outside the parallel curves just as they did in Blumenfeld's experiment.

It is obvious that such a subjective space cannot be the result of straightforward optical projection, it must be the result of integrating from angular elements in accordance with the metric of that space. In that case, it must be possible to construct "rooms" differing in size and shape which when viewed from the right point, will be indistinguishable to binocular vision. This had, in fact, already been done empirically at Dartmouth by Professor Adelbert Ames.

In the final section of his paper Luneburg observed that our scale of size seems to contract with increasing values of γ, the binocular parallax, and that such a well defined contraction probably has a physiological basis. So far we are not in a position to indicate such a basis; it may be that we never shall be, for we are sailing very close to the boundary line between brain and mind. But such a physiological basis is far from impossible, or even improbable, a possible mechanism has already been suggested, but time makes it impossible for me to enlarge on that now.

The reason for mentioning such a possibility is that once one accepts the idea of a physiological basis for our visual space one is bound to accept it as nativistic. Yet we started with the story of Helmholtz's childish mistake which has so often been quoted in support of the empiricist view. Can we reconcile this with the idea of nativistic space with a physiological basis? Yes, we can. We have already noticed that our appreciation of what we see must be based on a process of mathematical integration. It is not the γ, θ and ϕ of a system of bipolar coordinates that we use but their derivatives. In view of the finite structure of the retina and brain, it may be more proper to think of vision as a process of integration from finite differences $\delta\gamma$, $\delta\theta$ and $\delta\phi$. Such a process needs to be supplied with a scale factor if it is to give a unique answer and that scale factor is what the child

Helmholtz lacked but experience provides. The experiment of the distorted congruent rooms shows that it does not always provide the right one.

It is this need of a scale factor which gives pattern and such factors their force. It is the mind's preference for a square, or rectangular window that causes it to select the scale factor which straightens out Professor Ames' distorted rooms. All of you will remember Professor Ames' proposition that our sensations are related to the outside stimulus patterns but cannot be derived from them. Luneburg derived a mathematical formulation of visual space which permits this, and, moreover, which meets all Tschermak's requirements for a theory of binocular vision, even though it seems certain that Luneburg never heard of them. In addition, he has, in my view, settled the age old difference between the empiricists and the nativists, and, welded together the somewhat disjointed work of the Gestalt school and shown its true importance.

Before I go any farther, I am anxious to assure you that I am not one of those people who are always trying to belittle the role that psychology plays in vision, still less am I one of those who decry its clinical importance. But I do belong to that school of psychology which is grateful to those who succeed in incorporating anything we are studying into the domain of one of the exact sciences.

I am the last man who would wish to belittle the contributions the psychologists have made to our understanding of binocular vision, and I am still farther from wishing to imply that they have already given us all they have to give. All I am trying to do is show that there does not seem much more to be done along those lines. It is, no doubt, of interest to the psychologist to study the question of why the mind prefers this pattern or that, but in my view, he has little, if any, more to add to that phase of our understanding of binocular vision.

I have now given an illustration of an aspect of binocular vision on which the psychologist has done invaluable pioneer work and has succeeded in bringing it to the point where the mathematician has taken over and formulated the problem for the physiologist. I propose to spend what time is left to me in trying to point out two problems where I believe that the psychologist's immediate effort can most profitably be directed. I must stress, at once, that these are questions to which I have no answer but which I hope may in part be answered in the discussion.

These two questions are: What is the stimulus to convergence? And: What is the stimulus to accommodation? I do not know the answer to either question, nor even whether they are one question or two.

It is very easy to satisfy oneself that when a prism sufficient to provoke momentary diplopia is put before one eye you never observe the diplopic images separate before coming together; the initial vergence movement is always in the right direction, there is no trial and error about it, yet the subject cannot tell whether he experienced crossed or uncrossed diplopia, or, which is the same thing, whether the prism was presented base-in or base-out.

Similarly, Finchman has found, objectively, using the coincidence optometer, that the same thing applies to accommodation. If a lens of not too great power is placed in front of an eye it will change its accommodation, again the initial movement is always in the right direction. If the lens is more than the eye can overcome easily it appears that it makes no effort to overcome it.

I found this so surprising that I took a young myope who was habitually overcorrected by about 1 diopter and had her hold different supplementary lenses in front of one eye while I watched the reflex from the other with a retinoscope. The response to plus and minus lenses of up to 1 diopter was definite and immediate. The first change in the reflex was always in the right direction. But neither a plus 3 or a minus 3 diopter lens elicited any change, the spherical aberration of the subject's eye, which vanished for a quarter of a diopter, remained visible. Naturally, the plus three was more than she could compensate for but she could easily accommodate for the minus three, but only did so voluntarily after a considerable interval.

Inasmuch as the subject was looking at the distant test type and the other eye was occluded, both by my head and the beam of light from the retinoscope, neither awareness of distance or any prismatic effect of introducing the lens acting through convergence can have influenced the result.

Ittelson and Ames[3] have shown how an illusory impression of nearness will influence a subject's accommodation and his convergence in monocular vision and his accommodation in binocular vision, though in this case no change in convergence was recorded, either as diplopia or changed retinal disparity.

Morgan[4] has recently published a most interesting paper on the accommodation-convergence relationship in which he attempts to evalu-

ate the psychic nearness factor. In this he calls attention to the fact—also reported by Hofstetter—that this factor is sometimes negative and suggests that the correct interpretation of this result is that it may represent part of the fusional element of convergence which has become a conditioned reflex. It seems to me that we have to accept this as the correct explanation and that it should, in that case, be identified with what Chavasse[5] called the Harmonic Convergence Reflex.

Another curiosity of accommodation and convergence was recorded by Ames and Gliddon.[6] They found significant differences between the accommodation exercised on print and on stereoscopic figures at different distances. It seems reasonable to link this with the fact that a subject who showed a substantial fixation disparity on a fusible target without stereopsis, showed either less fixation disparity or poor depth appreciation when a stereoscopic target was substituted. This suggests that in turning his eyes towards more central fixation the subject changed his accommodation at the same time. It will be remembered that, under the conditions of their experiments, both Ames and Gliddon[6] and Adamson and Fincham[7] found a very much tighter linkage between accommodation and convergence than those workers who relied on the subjective impressions of the subject have led us to expect.

Pollack[8] has suggested, at intervals, that there is no linkage between accommodation and convergence. Against this, I have reported[9] two cases where binocular vision was lost in extreme infancy, if it had ever developed, which none-the-less with adequate dissociation showed approximate orthophoria for distance and a normal accommodation-convergence relationship. In addition, paralysis of accommodation and convergence as a clinical entity, notably as a sequel of encephalitis, is well known. I therefore find it necessary to reject Pollack's suggestions and still accept Chavasse's[5] account of the accommodation-convergence relationship substantially as he wrote it 12 years ago.

I have now put several rather odd facts before you. It is clear that the blur circle is not the incentive to accommodation, as is so often stated. When we attempt to piece them together I feel that the most promising starting point is the effect of psychic nearness on accommodation when the size of the target, a projected image, was changed optically while its position remained unchanged. Changes in accommodation of about half a diopter were recorded together with approximately appropriate changes of convergence. In most cases these changes

were great enough to blur the target when seen monocularly. Binocularly the experiment becomes far more difficult, but Ittelson and Ames were able to record an impression that the target was moving and to show that some change in accommodation took place, but they failed to find any change in convergence or fixation disparity.

The fact that accommodation changes in response to small dioptric differences, but not for large ones, would tempt us to think that there was some mechanism for placing the circle of least confusion at some particular position on the foveal cones, but they are far too short to support any such idea.

Another obvious possibility, in view of the fact that the pupil size is reflexly affected by accommodation and convergence, is that the change in brightness of a surface with distance might contribute to the initiation of accommodation. A preliminary experiment on the subject referred to above showed no change in accommodation when the lights of the room were switched on and off.

It is necessary, however, to emphasize that this was only a rough experiment conducted with a retinoscope, not an accurate measurement such as Ames and Bannon have done by stigmatoscopy. As it will be easy to repeat it under more controlled conditions, that will have to be done when a more systematic attack is made on the problem.

That we can sometimes recognize depth in a stereogram, even though we have failed to fuse it, suggests that there is a subconscious mechanism which can appreciate the difference between crossed and uncrossed diplopia even though the conscious mind cannot. If this is so, we have a satisfactory explanation for the act of fusion being always in the right direction. However, it is necessary to be very cautious about accepting the possibility of stereopsis without fusion. Though I have thought that I was seeing it on more or less elaborate stereograms, I have never got any sense of depth out of the simplest possible stereogram, four dots, two seen by each eye, until I had achieved fusion. So I suggest that where one seems to get stereopsis and diplopia at the same time, what has occurred is that some part of the picture has been fused for long enough to give the right sign to the depth which is known to be present in the design. Once that has occurred, even over a very small area, the mind has the necessary data to interpret the design.

I am now going to digress in order to ask a question which does not concern binocular vision but does concern the psychology of vision. Again, it is a question on which far more work has been done over

here than in England. Workers in this country have done a lot of experimenting on people with reading difficulties. By all rights, it is a subject in which I should be far more interested than I am, since I am a very slow reader. I know that, in many cases, great success has been achieved by training in visual skill and I am curious to know whether that is always successful.

From consideration of my own reading difficulties, I am inclined to believe that, in some cases, reading difficulties may not be a visual difficulty but be inherent in one's mental make-up. There is nothing wrong with my visual acuity, 20/10, or my stereoscopic acuity, which is about 3 seconds of parallax, or my muscle balance. My visual skill, both as an instrument maker and as a microscopist, suggests that I should be a quick reader, yet if I read quickly nothing seems to enter my mind. All my life I have memorized with great ease, and just as easily by hearing as by reading, but if I am reading to learn, I read at reading-aloud speed and mentally hear the words. It is the only road to my brain.

Is this an innate characteristic of my mind, or is it the result of early training? I am naturally lazy and my family were all given to reading aloud to us when we were children. It may be that from this listening I developed and facilitated the link from the auditory areas to the association areas of my brain, or it may be that individuals vary greatly in this respect. Be that as it may, my own memory is almost purely auditory, I have the greatest difficulty in remembering faces but I do remember names, though I usually don't know which face to tack them onto.

I have not noticed any correlation between the slow readers of my acquaintance and a love for music, nor between slow reading and a difficulty with faces. I am hoping for enlightenment in the discussion.

108 ECCLESTON MEWS
LONDON, S. W., ENGLAND.

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USE OF TELESCOPIC SPECTACLE WITH RETINITIS PIGMENTOSA

A CASE REPORT*

John R. Kennedy†
St. Paul, Minnesota

CASE HISTORY

May 31, 1950, Mr. H. H., age 27, unmarried male, referred for visual examination prior to rehabilitation as a visually handicapped person. Referring agency, Minnesota Society for the Blind. Patient stated he had retinitis pigmentosa as did several members of his family. Had poor vision as a child.

General health was good, having no serious illness or surgery. Teeth in good repair.

Occupation, unemployed, but until two years ago, was actively engaged in farming.

COMPLAINT

"I am to have visual rehabilitation. If you can improve my vision any, it will help me in this training."

EXTERNAL OCULAR

Lids, conjunctiva, pupillary reflexes normal.

OPHTHALMOSCOPY

Congenital lamellar cataracts both lenses. Bone corpuscular pigment throughout fundus more dense peripherally, slight palor discs, arteries definitely narrowed.

VISUAL FIELDS

Constricted to 20°.

STATIC RETINOSCOPY

R —4.50 sphere
L —4.00 sphere

SUBJECTIVE

R —4.00 —50 x 35 = 20/300
L —4.00 —50 x 10 = 20/200

Jaeger type 1.25M could not be read.

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*Submitted as portion of the entrance requirements of the American Academy of Optometry. Approved by the Examining Board. For publication in the June, 1951, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Fellow, American Academy of Optometry.

Vision through 2.2 Kollmorgen telescope on left (best acuity) was 20/60 on projected Snellen type. Various reading adds were used until it was determined that a +12.00 was best for this patient. Through this add he read 1.M Jaeger with remarkable ability.

NOTE: This writer uses the procedure outlined by the Kollmorgen Company in fitting telescopic lens. To date, five telescopic units have been prescribed for patients, all with similar results. A telescopic lens should never be prescribed until other less expensive sub-normal visual aids have been tried and found ineffective, e.g. hand magnifier, high plus adds. (+ 3.50 to + 4.50) "Aloe" clip-on reading unit, etc.

SUMMARY

The diagnosis of retinitis pigmentosa was substantiated by ophthalmological consultation. It was decided to prescribe a telescopic lens for this patient because he demonstrated marked improvement in acuity not found by other refractive means. The "tunnel vision" found in these cases is of adaptive value in learning to use telescopes. The patient does not complain of constricted fields as does a case of senile macular degeneration. It is fully realized that retinitis pigmentosa (old term) is a progressive degenerative condition and the prognosis is poor, but this patient had a specific need for best possible acuity to help prepare him for further loss of vision.

As of this writing, the patient is happy with his visual aid and reading a great deal.

The procedure of refracting a sub-normal vision case for telescopic lenses includes a retinoscopy if possible. The ophthalmometer is often helpful in determining the best prescriptible lens. The subject refraction is made by first placing the patient as close to Snellen chart as necessary to enable him to read the largest letters, even five feet may be used. The refraction is then made to obtain best possible visual acuity. The patient is then moved back from chart to twenty feet and the lens altered, plus reduced, to again obtain best V. A. which is recorded. The telescopic unit is now placed in trial frame with the subjective lenses. The patient is instructed to obtain best "focus" by moving head and eyes slightly until he sees most clearly. Record V. A. through telescope.

The add is determined by placing spherical convex lenses in front of telescopic unit in powers of + 6.00 to + 14.00. Give the least add for best reading at greatest distance from eyes. Usually a + 8.00 is found correct.

It is advisable to have patient receive one or two training periods in the use of the final unit before he is allowed to take it home. With practice and experience most patients show improved acuity over that

recorded at time of testing. Generally, and one cannot be specific, the acuity will improve from 20/100 to 20/50 with a telescope over the best ophthalmic lens correction. The writer does not consider a telescopic lens for patients who have 20/80 acuity or better with ophthalmic lenses.

852 LOWRY MEDICAL BUILDING
ST. PAUL, MINNESOTA.

ANNOUNCEMENT

BANNON JOINS AO BUREAU OF VISUAL SCIENCE

Dr. Robert E. Bannon, research editor of the AMERICAN JOURNAL OF OPTOMETRY for the past four years, will join the Bureau of Visual Science of the American Optical Company, Southbridge, Massachusetts, July 1, 1951.

In his new position, Dr. Bannon will assist Dr. Paul Boeder, Bureau director.

Dr. Bannon is a former staff member of the Dartmouth Eye Institute, Hanover, New Hampshire, and former faculty member of the School of Optometry, Columbia University, New York City. For the past year, in addition to his Journal activities, Dr. Bannon has been in practice in Hanover.

In moving to the Bureau of Visual Science, Dr. Bannon has resigned as Research Editor and given up his Hanover practice. He is remaining on the Editorial Council of this Academy publication.

We of the Journal staff have enjoyed our association with Dr. Bannon during the past several years and wish him success in his new scientific activities.

CAREL C. KOCH.

AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY
Established 1924

Vol. 28 June, 1951 No. 6

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Publication and Academy Office: 1502 Foshay Tower, 821 Marquette Ave.
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Annual Subscription, United States and Canada, $6.00 in Advance; Foreign, $6.50; Single Copies 60c.

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Published Monthly by the
AMERICAN JOURNAL OF OPTOMETRY PUBLISHING ASSOCIATION

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OPHTHALMOLOGICAL OPTOMETRIC RELATIONSHIPS IMPROVING

In 1935 the American Medical Association adopted the following resolution upon the recommendation of the Section on Ophthalmology: "It is unethical for any member of the A. M. A. to give lectures or courses of instruction to or consult with any one not associated with the actual medical service."

As Dr. Lawrence Post has pointed out in his recent editorial, January, 1951, AMERICAN JOURNAL OF OPHTHALMOLOGY, only

those so-minded paid any attention to this restrictive resolution. Many ophthalmologists continued to teach pathology and related subjects in our optometric schools and colleges. They also continued to lecture at optometric meetings and to employ optometrists in their offices and hospitals. At no time was disciplinary action ever taken. However, this unfavorable resolution was responsible for considerable ill feeling and lack of cooperation between ophthalmologists and optometrists.

Realizing that optometrists care for more than two-thirds of the refractions in this country and that upon them rests the great responsibility of detecting patients with disease, a group of ophthalmologists attempted in 1941 to rescind the prohibitive resolution. The Section on Ophthalmology voted favorably but the rescinding resolution was presented too late for action by the House of Delegates of the A. M. A. Another unsuccessful attempt was made in 1942. However, in 1946, a resolution permitting instruction of non-medical groups by ophthalmologists was introduced and passed unanimously by the Section on Ophthalmology of the A. M. A.

This 1946 action was not adopted by the House of Delegates of the A. M. A., because, Dr. Post believes, of a misunderstanding by the proponents of the general procedure in the House of Delegates. Finally, at the 1950 meeting of the A. M. A., in San Francisco, the resolution permitting collaboration with non-medical groups on the part of ophthalmologists was passed by the House of Delegates.

In recent years there has been much evidence of improved relationships between optometrists and ophthalmologists. The National Society for the Prevention of Blindness has encouraged such cooperation. Many prominent optometrists and ophthalmologists have long felt it a disservice to the public to have animosity between those caring for the visual needs of the population. The Better Vision Institute has helped in this direction and recently another witness to improved relationships is the National Interprofessional Committee on Eye Care under the able chairmanship of Dr. Avery D. Prangen, ophthalmologist of the Mayo Clinic. In this latter group, ophthalmologists, optometrists and opticians are working together for better overall eye care for the public.

It is hoped that these auspicious events will justify the hard work and high ideals of those who have labored in the belief that by working together we can render a better service to the public and help toward the major goal of comfortable vision and the prevention of blindness.

ROBERT E. BANNON.

VISUAL REQUIREMENTS FOR HUNTING

In many, if not in most, states in this country almost anyone can get a hunting license at the county clerk's office without any qualifications as to the applicant's fitness to roam the woods carrying (and using) a weapon deadly not only to the animals and birds, but also to human beings. Albeit, hunting licenses do not permit the shooting of people; nevertheless, during each hunting season there is a toll of human lives and injuries almost equal to that of the number of wild animals killed.

There are visual (and other) requirements for driving licenses in most states. It would seem that a rifle in the hands of a person with poor vision is as dangerous to humans as a person with poor vision driving of a car. In some state optometric associations this question of the visual fitness of potential hunters has been discussed already.

Besides the hunting "accidents" involving injuries and death to humans, there is also each year a considerable loss of livestock caused by hunters' bullets.

It is granted that there might be some difficulty in setting up visual prerequisites for a hunting license for hunters and administering such requirements. However, as a first approximation, it would seem that hunters ought to have at least as good vision as that necessary for driving a car. A simple means of facilitating the obtaining of evidence of adequate vision for hunting might be that the applicant be required to show a driver's license. Or, the hunter might be required to read the Snellen Chart to the extent required in each state for a driver's license. Either way would be a start in the right direction.

The consideration and promulgation of some visual requirements for hunting licenses should be within the province of optometry, and optometrists could well perform an important public service in this endeavor.

ROBERT E. BANNON.

CORRESPONDENCE

COMMENTS ON "THE PROBLEM OF VISUAL DIRECTION" BY WALLS

To the Editor:

It seems to me that no work bearing on optometry that has come to my attention in my optometric lifetime, can match in significant

brilliance and painstaking authenticity the treatise of Walls on "The Problem of Visual Direction" just completed in the Journal's most recent issue. May I offer my most earnest congratulations!

There is a theme that runs through the Walls work: a story repeated many times of sincere, competent workers arriving at the end of their research and thinking at mistaken conclusions because facts pertinent to their problems were either unknown at the time, or, being known by others, were unavailable to the particular researcher.

I rather hope that some way may be found to disseminate the Walls monograph widely, when it is published: so that we, in our day, may not witness any recurring spectacles of budding Helmholtzes being led astray by the lack of a working knowledge of the contents of Walls' "50 papers." I freely admit knowing nothing of these papers, and perhaps have been kept from going too far afield only by the stubborn persistency of what Walls terms a "simple faith."

Should any others be like-minded with me in this matter, I will be glad to join them, contributing suitably according to my means, in an activity designed to place the work in the hands of as many as possible of those who, missing the publication in the Journal, should by the nature of their studies or professional responsibility know about it.

WILLIAM M. ROBBINS, O.D.

426 Provident Bank Building
Cincinnati, Ohio

To the Editor:

I wish, also on behalf of the German Society of Optometry, to thank and congratulate the American Journal of Optometry and the author, G. L. Walls, upon the excellent and searching paper on "The Problem of Visual Direction" as it appeared in the last three issues of the Journal. We shall with all probability relate the contents of this paper to the Berlin members of our society on the occasion of our monthly meetings.

HEINZ REINHARDT, Secretary.

Deutsche Gesellschaft fur Optometrie
Berlin-Steglitz, Peschke Strasse 3
Berlin, (U. S. Sector), Germany.

EDITOR'S NOTE: At the conclusion of the Walls papers, many appreciative letters were received. Space permits only the printing of the above letters which were typical. The American Academy of Optometry is now arranging for the publication of the entire work in monograph form. A subsequent issue of the Journal will announce the publication date.

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

BEST WISHES TO THE A. O. A. AT NEW ORLEANS

About a year ago, as the American Optometric Association was going into its annual meeting in Minneapolis, the war in Korea got underway. Last June there was much speculation among the optometrists present as to what the future would hold for us in that fracas. What started out to be a relatively small North Korea-United States action has slowly developed into a Communist-United Nations war of much larger proportions. A year later the entire question of just where that war is headed is still obscure.

This year, as the A. O. A. is about to gather at New Orleans, other similar international flare-ups of possibly serious nature seem imminent. As this issue of the Journal is being readied for the press, the Iranian-British situation is drifting towards a point where here, too, the military may be called into action. The French still fight the Communists in Thailand, and the Arab-Israeli clash again brings tension in their part of the Near East. These are all little wars to be sure, but enough of them may result in a holocaust known to historians as World War III.

This is A. O. A. Congress time. A period when our energies should be centered around the many pressing optometric policy questions crying for attention. Yet again this year we are distracted by the shadow of these international clashes, into all of which the United States could be drawn. Our delegates will again have to do their work with the specter of these quarrels in the immediate offing. This makes their job harder, but it can and must be done. The Congress last year had a good record of achievement. May the New Orleans session do as well.

A. O. A. CONSIDERS UPPING DUES

At the coming meeting of the American Optometric Association at New Orleans the delegates will vote on again raising the annual dues of the A. O. A. This time from $15.00 to $20.00. There is every possibility that this change in dues will be adopted. If the A. O. A. can bring its membership to the 10,000 mark, through the State opto-

metric associations, these new dues payments would result in an annual income of $200,000. This sum should prove ample for the legislative and public relations work of the organization—these being the two major fields of activity of the A. O. A.

LIST OF MONOGRAPHS NOW AVAILABLE

A four-page folder listing approximately 100 available Academy monographs will be mailed on request to any professionally interested persons. A card to the Academy office, 1502 Foshay Tower, Minneapolis 2, Minnesota, will bring the list by return mail.

ANNUAL MEETING OF ACADEMY IN NEW YORK CITY

Academy members are now starting to plan their coming trip to New York City. The 1951 annual meeting of the American Academy of Optometry will be held at the Hotel New Yorker, December 8, 9, 10 and 11. Dr. Meredith W. Morgan, Jr., School of Optometry, University of California, Berkeley, is chairman of the papers and program committee for the coming meeting. He reports a number of scientific and clinical papers already scheduled and urges other members who are planning to present papers to communicate with him as soon as they have selected their subject.

CANADIANS HOLD FIRST ALL-CANADIAN CONGRESS

Among those sharing the lecture floor this month at the All-Canadian Optometric Congress were Dr. Charles Sheard, Mayo Clinic, Rochester, Minnesota; Dr. E. J. Fisher, dean, Ontario College of Optometry, and Dr. Darell Boyd Harmon. The three-day session, the first of its kind sponsored by the Canadian Association of Optometrists, was held in Winnipeg June 10-12. One day was reserved for discussion of national optometric problems. The educational program centered around the "coordinated classroom."

CAMPUS NEWS

This month brings to a close a turbulent academic year for our schools of optometry (along with almost all U. S. educational institutions). The records will show 1950-1951 as a trying term for optometric educators who were faced not only with normal educational problems, but with financial problems caused by unprecedented inflation, dropping enrollments because of our nation's military need of young men, and a decision on whether or not to accelerate. But in the face of all these problems, progress in our established schools continued unabated, and two new optometric colleges were organized, one at

Indiana University, the other at the University of Houston.

Indiana's program will be a two-year pre-optometry, three-year optometry course. Pre-optometry studies will be offered during the 1951-52 academic year, and the first year of professional study in 1953, according to latest University plans.

Another progressive step was completed with the dedication of The Ohio State University's new School of Optometry building June 10. Dr. Carel C. Koch, Editor, American Journal of Optometry, was the dedication speaker. Ceremonies were followed by an open house and inspection of the new building, which is part of the University's new Health Center. The new two-story structure contains the clinic, office and classroom space, a machine shop, a precision optics shop and a photographic dark room, as well as the Lionel Topaz Memorial Library. Space has also been reserved for a museum of visual science. Participating in the dedication were Dr. Glenn A. Fry, director of the School of Optometry, Vice President Harlan H. Hatcher, Dean Frederic W. Heimberg, College of Arts and Sciences, and Dr. Harold Oyster, Marietta optometrist.

On Monday, June 11, following the dedication, the school held a day-long scientific program in which the following educators took part: Staff members Drs. M. J. Allen, Glenn A. Fry, V. J. Ellerbrock; Dr. Marvin Whitman, Portsmouth; Dr. S. B. Lee, Cincinnati; Dr. R. M. Hall, Cleveland; Dr. F. W. Staubach, Toledo; Dr. L. G. Mitten, O. S. U. industrial engineering department; Dr. E. H. Westland, Cambridge, Pennsylvania, and R. A. Sherman, Rochester.

At Pacific University, the School of Optometry held ground-breaking ceremonies for its new building, May 26, with Dr. A. M. Skeffington the guest speaker.

Another recent development: Dr. Ralph Green, dean, Massachusetts College of Optometry, has announced completion of arrangements with Cambridge Junior College for the establishment of a pre-optometry course.

Pennsylvania State College of Optometry's first summer graduate contact lens course started June 22, will run until July 1.

NEWS BRIEFS

England's International Optical Congress will soon be getting under way in London (July 10-13) with nearly 40 papers scheduled covering all phases of visual care. Lecturers from several countries, including the United States, will appear in the scientific program. Chairman of the Congress is H. B. Marton, Fellow of the British Optical

Association (Hons.). . . . Dr. Harold Fisher, New York City, Dr. Herman M. Burian, Boston, Dr. Frederick W. Brock, Staten Island and Dr. John R. Wittekind, Morrisville, Pennsylvania, were among the speakers at the recent annual meeting of the New York State Optometric Association in New York. . . . The Titmus Optical Company, Inc., has again been honored for its outstanding record of employing the handicapped. This year's award came from President Truman's Committee on Employing the Physically Handicapped. In 1948, the American Legion recognized Titmus similarly in appreciation of the firm's employment of handicapped veterans. . . . Optometrists honored recently: Dr. Meredith W. Morgan, Jr., School of Optometry, University of California, by honorary membership in Omega Epsilon Phi, national optometric fraternity, for outstanding educational achievements; Dr. Richard Feinberg, Dean, Pacific University School of Optometry, with a plaque from the same fraternity for distinguished, meritorious service to the profession. . . . Recognized in New Jersey recently for outstanding service to the profession were Drs. George L. Brown and John J. Brown. The testimonial dinner was sponsored by the Central New Jersey Optometric Society. Both doctors have been active for more than 25 years in optometric affairs and practice. . . . Also honored by a testimonial dinner: Martin Topaz, editor of *The Optometric Weekly*. The banquet was sponsored by the optical division of the United Jewish Appeal in recognition of "Marty's" efforts toward harmonious relationships in civic and professional affairs. . . . "Happy, Healthy and Wise" is the title of Dr. Laurence P. Folsom's most recent book. Dr. Folsom, a practicing optometrist of South Royalton, Vermont, and recipient of the D. S. F. O. Gold Medal in 1935, has authored several philosophical works. . . . Massachusetts College of Optometry's Spring postgraduate program on reading difficulties drew 119 optometrists from 71 cities and towns in four New England states, according to Dean Ralph H. Green. . . . The A. O. A.'s department of public information now has reprints on hand of J. D. Ratcliff's article, "How Good Are Eye Exercises," recently published in *Today's Woman*. . . . The 50th anniversary convention of the New Hampshire Optometric Association will be held at the Mount Washington Hotel, Bretton Woods, New Hampshire, June 24-26. Dr. Robert E. Bannon will be the educational speaker. Dr. Melvin B. Dunbar of Lebanon, is general chairman. . . . The library project of the Minnesota Optometric Association is getting under way to enable members to borrow the latest books in optometry and related fields. Dr. Richard Edwards of Bemidji is in charge.

OPTOMETRISTS IN THE NEWS

Dr. Daniel G. Hummel, immediate past president of the American Academy of Optometry, and practicing optometrist of Cleveland, Ohio, was awarded the honorary degree, Doctor of Ocular Science, by Chicago College of Optometry June 1. The degree was conferred on Dr. Hummel at the College's sixth graduation ceremony, at which he was the commencement speaker.

Also awarded the D. O. S. degree at the same time were Dr. Michael Kalk, assistant professor of optometry at C. C. O., on leave with the United States Navy, Dr. Reuben Seid, president of the College, and Dr. Nathan A. Robbins, Buffalo, New York.

Honored at the College of Optometry, Pacific University, with a Doctor of Humanities degree—Dr. A. M. Skeffington, director, Optometric Extension Program. Dr. Skeffington received the degree on May 27th at commencement exercises.

CAN YOU HELP?

Miss Annie Orfanos, librarian of Northern Illinois College of Optometry, reports she has now completed an entire set of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY, except for the following:

Volume 1 (1924) all issues. Volume 2 (1925) all issues. Volume 3 (1926) numbers 2, 4, 5, 6, 7, 8, 10 and 11. Volume 4 (1927) numbers 1, 3, 4, 5, 6, 7, 8, 9, 10 and 11.

Any reader who can furnish any of these missing issues should get in touch with Miss Orfanos.

CORRECTION

The May issue of this Journal carried a book review on MacElree's "Manual of Ocular Pathology for Optometrists," in which the price was listed at $8.00. The correct price for the new edition is $10.50.

NOTICE TO SUBSCRIBERS

If you are planning to change your address, the Journal would appreciate notification of the change as early as possible. Send the Journal a letter, post card or post office form No. 22S, giving us your old and new addresses, with the zone number if any. The old address is essential.

As it takes considerable time to handle details of a change in address, our subscription department would appreciate, if possible, a notice four weeks in advance of a change in address, so the subscriber may receive the magazine without interruption.

BOOK NOTICE

SPECTACLE FITTING AND OPTICAL DISPENSING. L. S. Sasieni. Hammond, Hammond & Co., Ltd., London, England. 294 pp. 241 illustrations, two appendices.

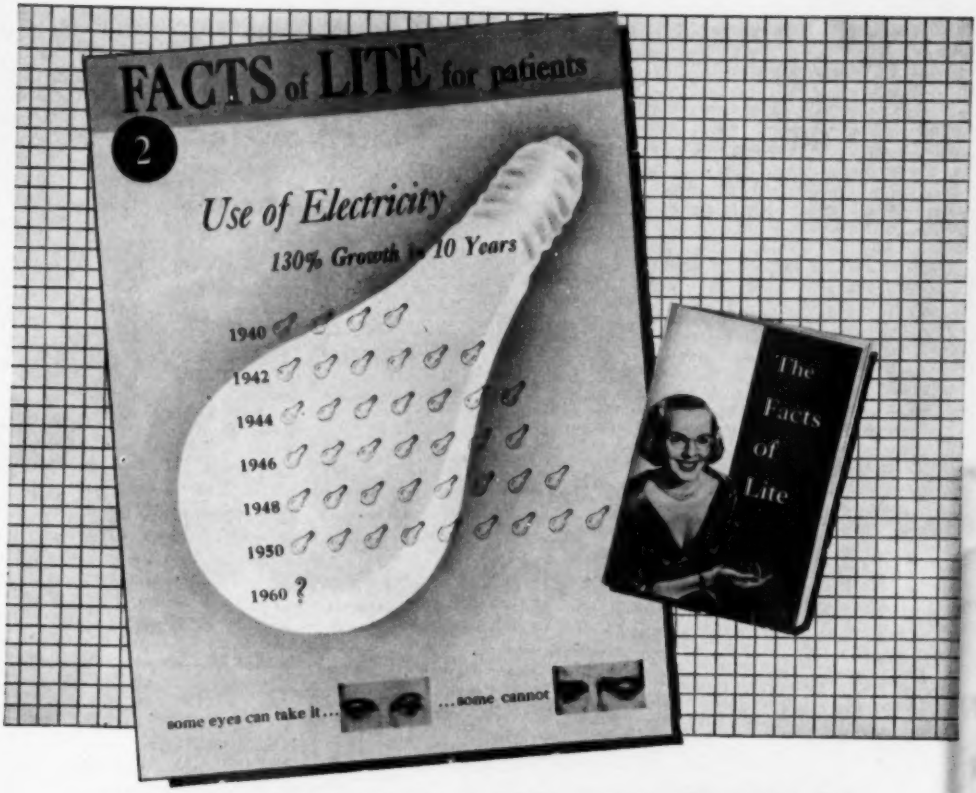
If one carefully surveys all the published books and manuscripts on mechanical and ophthalmic optics, it is soon apparent that a seriously neglected subject is spectacle fitting and optical dispensing. This well written, illustrated textbook helps correct this situation.

The major sections are devoted to frame rules and measurements, face measurements and the design of spectacles. As background for the section on frame measurements, an excellent survey is included on modern day mountings and frames. Also, there is a very adequate presentation of the various types, and proper use, of pliers available for making adjustments.

The author knows his subject matter thoroughly. This is particularly well exemplified in the chapters on face measurements and the design of suitable styles for different head and face configurations. In fact, if one were to choose the major original contribution in the book, it would be the description of the tools developed by the author and the procedures which he follows in the design of custom spectacle frames. Here the term, "custom spectacle frames," is used in contrast to frames fabricated at a factory to arbitrary specifications. In this latter case, the spectacle frames almost invariably are made without consideration of individual needs. When such a frame is used in the design of spectacles, the fitter usually chooses the frame most closely fitting all needs of the patient and then modifies it to provide an optimal fit. The success with which such a procedure can be followed depends upon the skill of the fitter, the available samples and many other factors. However, anyone who makes a sincere effort to design spectacles which complement one's appearance frequently encounters patients who could profitably benefit from a custom designed frame. In the book, a course to be followed in such a design is thoroughly discussed.

A question which continually confronted the reviewer while reading the book was whether or not the author tended to over-emphasize the need for custom designed frames. If the author's judgment can be clinically substantiated, and patients are significantly pleased with the added consideration, his recommendations should be carefully studied and put into practice by all optometrists.

VINCENT ELLERBROCK



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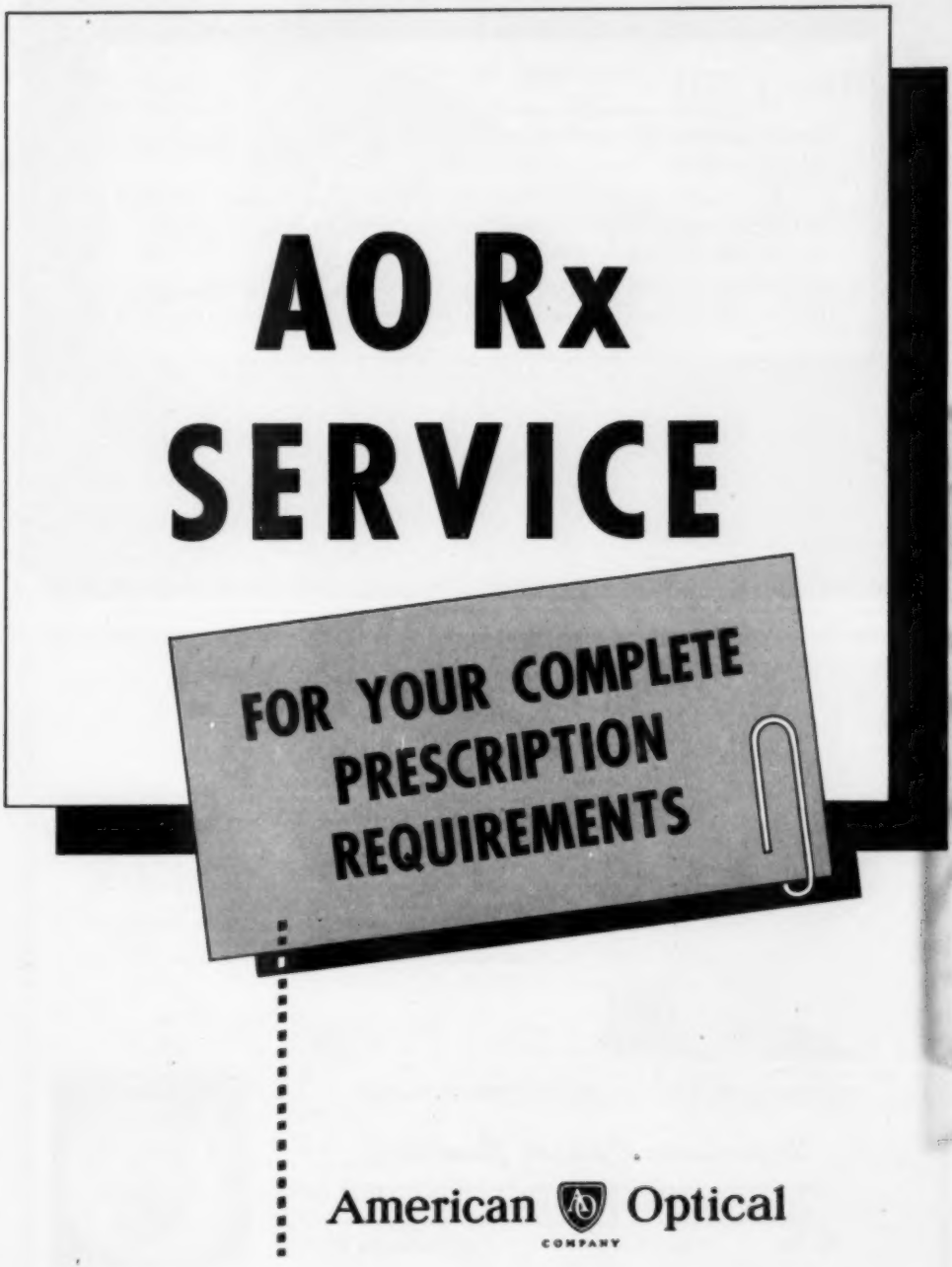
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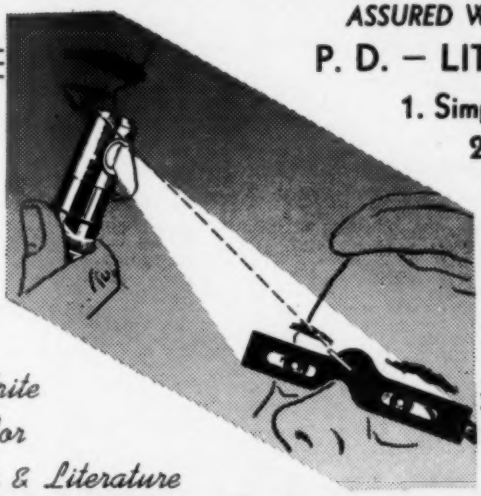

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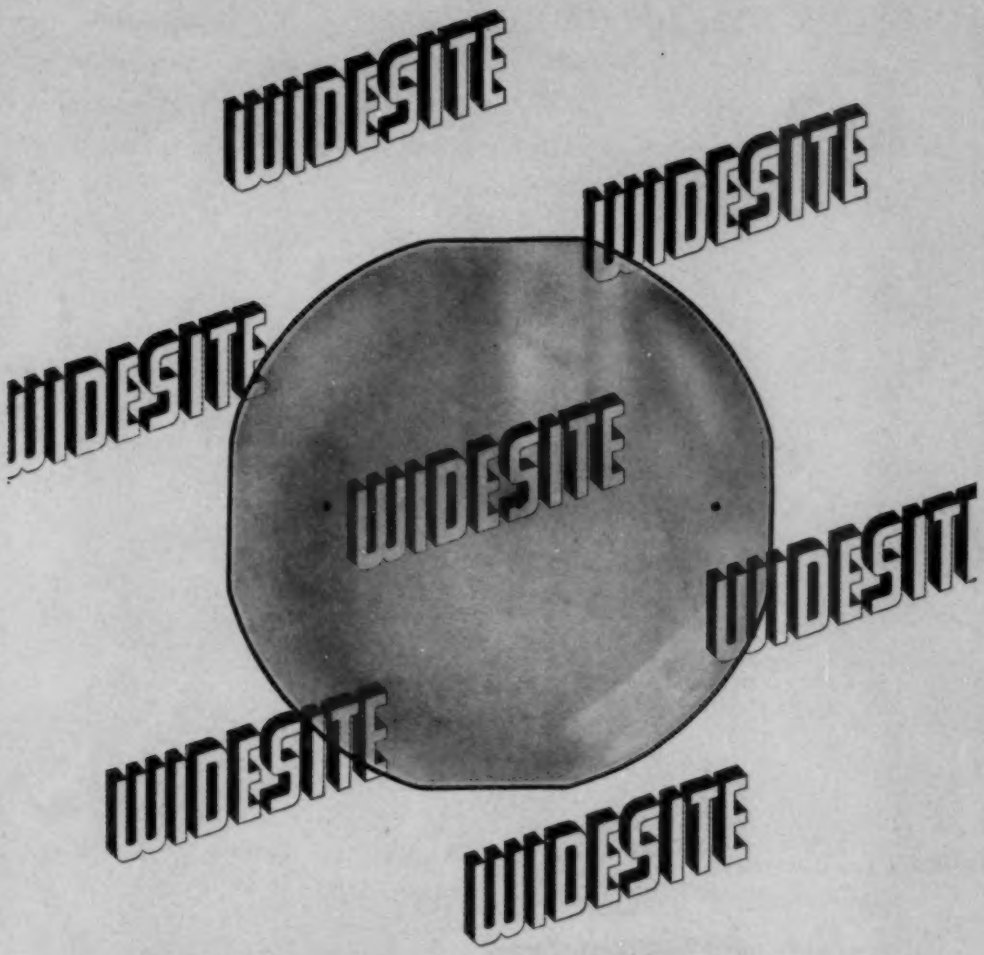

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